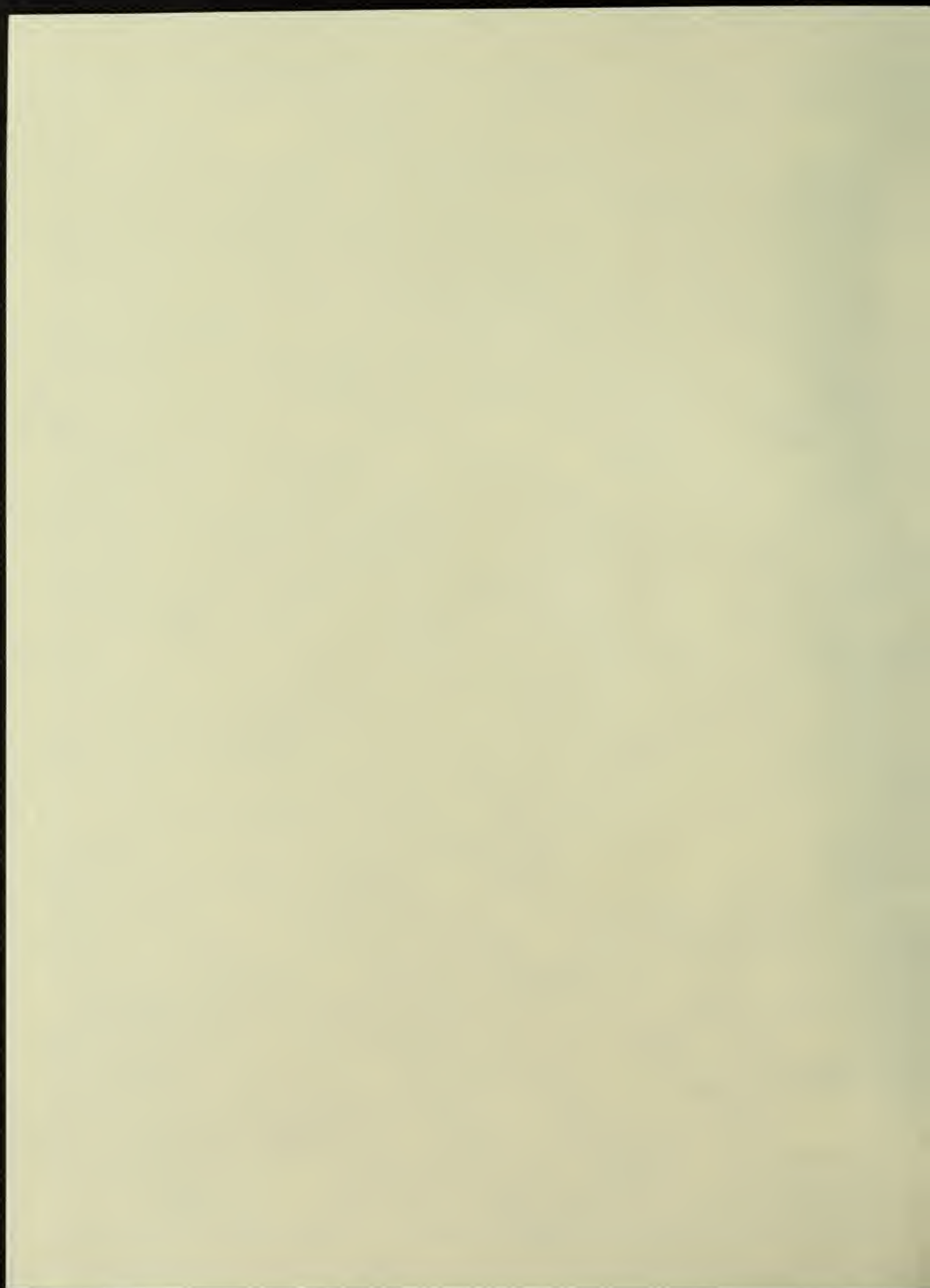


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The Professional Bulletin of Army Engineers



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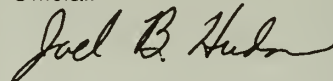
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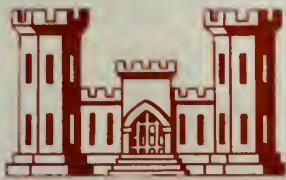
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Front Cover:

ENFORCE 2004 *Forging Our Future - Shaping Engineers for Joint and Multinational Operations.* Logo by the Visual Information Center at Fort Leonard Wood, Missouri.

Back Cover:

Images of U.S. Army engineers in Operation Enduring Freedom and other missions.

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Clear The Way

By Major General R.L. Van Antwerp
Commandant, U.S. Army Engineer School



Forging our Future - Shaping Engineers for Joint and Multinational Operations is not simply the theme for ENFORCE 2004 (26-30 April), it reflects the current operational environment and state of our Regimental transformation. In the last two years, we have gone from preparing for transformation to transforming. One of the featured articles in this issue of the bulletin, "The Future Engineer Force," outlines how we are shaping the Regiment at this moment—forging our future to meet the challenges of today and tomorrow. This transformation must be a rapid but purposeful change. As engineers, we provide a unique set of core competencies that critically enable the combatant commander and the joint team with the mobility required to provide a position of advantage at the tactical through strategic levels. We'll retain the best of our current capabilities and attributes and develop others that will increase relevance and readiness in joint and multinational coalitions. To continue to provide this support in the future, we will reexamine and challenge our most fundamental institutional assumptions, paradigms, and procedures.



In this issue, we have published our thought process to stimulate a "no-holds-barred" discussion here at ENFORCE—between leaders at all levels—and obtain feedback so we can make adjustments where necessary. I encourage those of you who cannot attend in person to send us your comments.

The first installment of the transformation framework is currently occurring in the 3d Infantry Division and the 101st Airborne Division. In accordance with the Chief of Staff of the Army's guidance, these two divisions are being reorganized into more modular, deployable, lethal, integrated, and joint interoperable units. The first installment of the Engineer Model clearly depicts a joint and

expeditionary flavor and defines what engineers must bring to the fight and how. It is the starting point for partnering on organizational solutions, equipment, doctrine, standards, and training strategies. It also becomes the reference point for the hard discussion we must have on joint interdependencies—we must become more interdependent if we are to optimize our support to the joint force commander. That means taking a hard look at divesting ourselves of certain "traditional" Army engineer capabilities. Equipment and organizations must be common for all engineer forces as much as possible. Imagine the increased flexibility the joint force commander has if a bridge unit in the Marine Corps has the same modular design as that in the Army, and both branches

undergo the same training regardless of component.

We are not only looking at transformation from the joint perspective but from the multinational perspective as well. We will enlist the members of the joint and multinational engineer communities attending ENFORCE this year to share their experiences and assist us in ensuring that engineers remain a relevant and ready force. Their perspective is invaluable as we refine the design of the Future Engineer Force.

I am looking forward to this year's ENFORCE being a celebration of engineers and the many achievements that have directly contributed to our nation's success in Iraq and Afghanistan. I feel an immense pride in our Regiment and our soldiers when I hear or read about the great works engineers are doing around the world. As many of you have experienced, these successes have not come without a price. We have lost comrades in arms, friends, and family in this Global War on Terrorism. I would like to close by paying respects to our most recent losses in the Engineer Regiment. Essayons!

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Private First Class Jonathan Cheatham
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Sergeant First Class Dan Gabrielson
Specialist Brandon Tobler
Staff Sergeant Kenneth Hendrickson
Sergeant Keith Smette

1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
4th Engineer Battalion, Fort Carson, Colorado
41st Engineer Battalion, Fort Drum, New York
52d Engineer Battalion Fort Carson, Colorado
203d Engineer Battalion, Joplin, Missouri
205th Engineer Battalion, Slidell, Louisiana
307th Engineer Battalion, Fort Bragg, North Carolina
379th Engineer Company, Nashua, New Hampshire
489th Engineer Battalion, Camden, Arkansas
588th Engineer Battalion, Fort Hood, Texas
652d Engineer Battalion, Spooner, Wisconsin
671st Engineer Brigade, Portland, Oregon
957th Engineer Company, Bismarck, North Dakota
957th Engineer Company, Bismarck, North Dakota

Lead The Way

By Command Sergeant Major Clinton J. Pearson
U.S. Army Engineer School



We are eagerly anticipating our 15th ENFORCE Conference, and we sincerely hope that you are looking forward to spending a week with us here at Fort Leonard Wood. Just remember to bring your colors—we want to display them proudly at the Regimental dinner.

As Major General Van Antwerp stated, this year's theme is *Forging Our Future - Shaping Engineers for Joint and Multinational Operations*. This ENFORCE will be unlike any other, particularly because we are a nation at war. We will start the week with a day and a half of Council of Command Sergeants Major sessions. Some of the other highlights include a briefing on Career Management Fields from the Human Resources Command (HRC) (formerly PERSCOM); an update from the Directorate of Combat Developments on the Future Engineer Force; an Initial Entry Training/Initial Acceptance Test update by the 1st Engineer Brigade; Operation Iraqi Freedom/Operation Enduring Freedom Lessons Learned; Sapper Leader Course update; and a Noncommissioned Officer Education System (NCOES) update.

I'm also proud to announce the 1st Annual Joint Senior Noncommissioned Officer Symposium on *Engineers in Contingency Operations* from April 20-22 at Tyndall Air Force Base, Florida. This conference will include mostly senior noncommissioned officers from all of our sister services. If you are invited, I highly encourage you to attend.

Over the past quarter, we have been constantly assessing the Regiment's T3s (*Transform the Regiment, Train Soldiers and Leaders, and Take Care of the Regiment*) to meet our National Security challenges now and in the future. This concept *must* be embraced, and I can see it is taking shape. It's great to see everyone not only supporting this philosophy but also putting it into action. During Operation Enduring Freedom and Operation Iraqi Freedom, nine of the Army's ten active divisions will have been deployed to that region of the world. Currently, the largest rotation of Army forces in history is taking place. I've witnessed the deployment and redeployment of thousands of engineer soldiers throughout our Regiment—both Active Component and Reserve Component—and am pleased by their significant contributions and service to our nation in our joint effort to stamp out terrorism.

We must learn from those who have been deployed. The Engineer School recently surveyed Operation Enduring Freedom and Operation Iraqi Freedom veterans attending the



Captain's Career Course (CCC), Advanced Noncommissioned Officers Course (ANCOC) and Basic Noncommissioned Officers Course (BNCOC). By using their experience, we can develop education systems that are flexible enough to support today's wartime environment as well as future operating environments. Our education systems must train leaders to be capable of operating as part of a joint team. In the survey, participants reviewed the training objectives of the courses to make our curriculum more relevant to current operations. To date, 41 ANCOC, 50 BNCOC, and 27 CCC students have participated in this survey. Initial findings

were submitted to the Combined Arms Command Quality Assurance Office on 1 March 2004 and a final report is due 31 May 2004.

Another organization in the forefront of training is the Countermine/Counter Booby Trap Center (CMCBTC). From 1-18 March, the CMCBTC conducted specialized training for members of the 379th Engineer Battalion, which will deploy in support of Operation Iraqi Freedom. The battalion will assume the duties of the CJTF-7 Mine and Explosive Ordnance Information Coordination Center (MEOICC).

In September 2003, the first squad of four mine detection dog handlers in the Engineer Regiment deployed to Baghram Air Base in Afghanistan. They were certified and began supporting the mine-clearing company for Combined Joint Task Force-180. The mine detection dogs were a vital asset to the company because they facilitated the safe and timely expansion of the base camp. Their outstanding accomplishments in theater have proven to the Army the need for an organic mine detection dog capability. The squad has returned, but the noncommissioned officer in charge remains in Afghanistan, conducting relief in place with our second squad of mine detection dogs.

I'd like to pay tribute to Command Sergeant Major Edward H. Lugo (Retired), who passed away on 15 March 2004 at Walter Reed Army Medical Center in Washington, D.C. A veteran of more than 30 years of service, he served as the sixth Command Sergeant Major of the U.S. Army Corps of Engineers from July 1997 until his retirement in March 2001. Command Sergeant Major Lugo entered the Army in June 1970. He was the senior enlisted engineer soldier in the Army at the time of his retirement and had 12 years as a command sergeant major. Command Sergeant Major Lugo was—and always will be—a part of our engineer and Army family.



On Being an Engineer: Reflections From the Chief of Engineers

By Lieutenant General Robert B. Flowers

I was asked to write an article, a “heart-to-heart chat over a cup of coffee” to discuss what I consider important to pass on to Army engineers before I retire this summer. It’s my pleasure to do so.

In a few months, I’ll hand over Douglas MacArthur’s castles to the 51st Chief of Engineers and say farewell to the Army. After he retired, General MacArthur wanted an engineer to wear his castles, and as a result, every Chief of Engineers has had that unique privilege. For me it was not only an honor, it was a continual reminder that Army engineers are part of a long and proud history of service.

When I was commissioned from the Virginia Military Institute almost 35 years ago, my intent was to complete my initial service commitment and then become a civilian. But after about six months, I knew soldiering was what I wanted to do, and I never looked back.

Much has changed since I began serving in the conscript Army. Today’s all-volunteer force has improved training and education, and constantly evolving technology has allowed the Regiment to render more efficient and effective service. Our progress in building field force engineering capability is a prime example.

What hasn’t changed is that engineers take on the tough tasks and always answer the nation’s call. From my view, I see your great work every day, and it never fails to put a lump in my throat. I’m enormously proud of the entire Regiment—active duty, National Guard, Reserve, and civilians. The Regiment’s soldiers and civilians are serving around the world, often in dangerous conditions. What is being accomplished

in Iraq and Afghanistan is remarkable; there is no doubt that engineers are making a tremendous difference.

I will retire knowing the nation is in good hands. But before I go, I want to leave you with some parting thoughts.

Selfless Service

I’m often asked about what it takes to be a great engineer. The key is to be totally selfless and to be willing to do whatever it takes to make the team successful. As a platoon leader, I witnessed that type of selfless behavior. In 1970, when our platoon was bridging a frozen river—the Danube—in Germany, the bridge pontoon exploded. Many were injured, including the platoon sergeant, Sergeant First Class Jose Camacho. Although he was seriously injured, he refused to be taken away until all the other injured soldiers were taken care of and until after he had issued instructions to squad leaders to complete the day’s missions. His behavior that day demonstrated his totally selfless nature.

Right now, hundreds of U.S. Army Corps of Engineers civilians are working in Iraq, and they volunteered knowing that conditions remain dangerous. In October, Sacramento District employee Ghassem Khosrownia was injured during an attack on his convoy near Baghdad. He was undaunted, however. He said he wanted to return to Iraq and finish his important work. That type of selfless service is common in our civilian employees.

Our combat engineers are a testament to selfless service. Just one example is Bravo Company, 11th Battalion, 3d Infantry Division. The unit has suffered many losses, including Sergeant First Class Paul Smith, who valiantly fought off an assault at the Baghdad airport. He went through 400 rounds



Emergency operations personnel—accompanied by representatives from the Federal Bureau of Investigation and the Bureau of Alcohol, Tobacco, and Firearms—survey the damage at the World Trade Center.

of ammunition before he was killed. His determination, bravery, and selfless service saved many lives that day.

Often, selfless service is a family trait. Fellow engineers Command Sergeant Major Ioakimo Falaniko and his son, Private Jonathan Falaniko, deployed to Iraq with the 1st Armored Division. Less than one month after Private Falaniko arrived, he was killed in combat. Command Sergeant Major Falaniko said his son was proud to be a soldier and proud to serve his nation and that he understood the danger of answering the nation's call. After he buried his son at Arlington National Cemetery, Command Sergeant Major Falaniko said, "I will finish this fight," and returned to Iraq. That is true selfless service.

Those few examples demonstrate the type of engineer we have in today's Army. There are many other stories of bravery and selfless service—and that is why our Regiment is so strong.

Leadership

I've also been asked how to become a successful leader. One of the greatest lessons I've learned is that good leaders aren't born, they are developed—something the Army does very well. Soldiers today are in the nation's finest leadership development program. Wherever I've served—on the fields of Desert Storm; in Somalia; Kosovo or Bosnia; the training areas at Fort Leonard Wood, Missouri; Gulfport, Mississippi; Sheppard Air Force Base, Texas; or Washington, D.C.—I was surrounded by great leaders, skilled soldiers, and inspiring mentors.

Supervisors, commanders, and general officers taught me what right looked like, and I replicated the good things I saw. I always had support from my peers, I believe, because I did everything I could to support them. And I'm thankful for all the first sergeants and command

sergeants major I encountered along the way. They were great teachers to junior soldiers and officers. They led by example and taught me a lot about leadership and about myself. Let me pass along some of what I've learned:

Emulate Great Leaders. Read about and watch other leaders to discover what you want and do not want to emulate. My role models and heroes have always been soldiers, especially my father. I learned a lot by seeing how he treated others. He put people at ease, interfaced with them, and demonstrated that he cared about them. I've tried to follow his principles, including never asking anything of others that I wouldn't do myself.

Lead Eyeball to Eyeball. Great leaders are inspirational, have empathy, and are great listeners. To have those qualities, however, you must interface with those you lead. Too many



Photo by Specialist Ryan Smith

Combat engineers from the 671st Engineer Company patrol the Tigris River in Baghdad.



Army engineers installed two temporary bridges over the Khazir River on the highway between Mosul and Irbil. They were removed following repairs to the permanent bridge, which had been bombed during the fighting.

supervisors are captured by automation and think they can coach, teach, and mentor by computer. Some things have to be done eyeball to eyeball, and leading is one of those things. Find time to talk to people so you can find out what is happening. It becomes increasingly important as you rise in rank, because there is a reluctance to give the boss bad news. By interfacing with others, you know more about what is really going on. I made it a habit to run regularly with soldiers. At Fort Leonard Wood, I enjoyed running with different engineer classes each week to hear what was on soldiers' minds and to challenge them with questions. It was a good way to better know our great team.

Provide Regular Feedback. People must know where they stand and what they must do to improve. When I was a battalion commander at Fort Bragg, North Carolina, I visited an injured soldier in the hospital. When I asked if there was anything I could do, he said that he had been a private first class for a long time and didn't know why he couldn't get promoted. It turned out that he was working out of his military occupational specialty (MOS) because members of his platoon weren't comfortable around him on the demolitions range. His counseling statements didn't reflect that, however. Instead, the statements reflected only the positive: that he was in excellent physical condition and had tremendous spirit and a drive-on attitude. There was a real disparity between reality and what he was told. From then on, I required five things in counseling statements: strengths, improvement areas, suggestions on how to improve, training and education, and promotion potential. I also required monthly counseling for junior soldiers and quarterly counseling for more senior soldiers.

USACE

I'm enormously proud of the U.S. Army Corps of Engineers and the 35,000 employees who support the armed forces, provide disaster assistance, restore the environment, and help the nation's economy through civil works projects. I've been asked why the Corps still has a civil works mission.

Although the mission is steeped in our history, the value of retaining it in the Corps was readily apparent during Operations Enduring Freedom and Iraqi Freedom. Employees who usually are assigned to civil works projects transitioned quickly to support warfighters' technical and engineering needs. And they have done a terrific job.

In 1947, General Eisenhower spoke before the Senate Armed Services Committee and said, "I am firmly convinced that but for the existence of the Corps of Engineers as a peacetime organization and its resources of men, methods, training, and supply and its close association with the military through the years, the history of World War II would have been written more in blood than in achievement." General Eisenhower's words remain true to this day. And now that the Corps is restructuring, its service to the nation and the armed forces will be even better.

The Future

Developing a joint and expeditionary mindset is essential for the 21st century Army to succeed. I'm convinced that if there is any group that can thrive in a joint environment, it's engineers.

Engineers have shown time and again their ability and agility to see a job through under any circumstance. Since George Washington first called on engineers to help fortify Bunker Hill, engineers have always found a way to adapt and to accomplish the mission at hand. One hundred years ago this year, President Theodore Roosevelt selected an Army engineer to oversee a project that had been a failure—building the Panama Canal. The result? The most remarkable engineering feat the world had ever seen was completed ahead of schedule. When President Kennedy set a goal to send a man to the moon and return him safely to earth, no one knew just how to accomplish such a goal. Yet the U.S. Army Corps of Engineers went to work and helped to build National Aeronautics and Space Administration facilities at Cape Canaveral, Florida.

As you continue the Army engineers' heritage of service and accomplishment, continue to be flexible. Also, let me add, if at times your work is not recognized, that is okay. You know what you have done, your fellow engineers know, and that is good enough. There is a bright future ahead for the joint engineer team. Engineers have never let the country down, and I know they never will.

Final Thoughts

I will leave Army service with no regrets and only positive recollections. If I made a positive difference to those I've led, I've done my job well. My hope is that when people speak of me, they have smiles on their faces and remember me as a good man. It's been the privilege of a lifetime to serve with you. May God bless you, your families, and this great nation. Essayons!





THE FUTURE ENGINEER FORCE

PROJECTING THE CAPABILITIES OF THE REGIMENT

By Lieutenant Colonel Bryan Watson, Lieutenant Colonel David Holbrook,
Major Stephen Bales, Major Mollie Pearson, Major Brian Slack, and Mr. Mike Fowler

Our Army is at war. Since Operation Enduring Freedom and Operation Iraqi Freedom began, more than 444 soldiers have been killed in action and more than 2,252 severely wounded. The largest rotation of Army forces in history is taking place, and nine of its ten active divisions—all but the 2d Infantry Division, which is already committed to Korea—will have seen action in Afghanistan or Iraq. We have activated the largest number of U.S. Army Reserve (USAR) and Army National Guard (ARNG) soldiers since the Korean War.

Some may say this operational state, that of war, is the exception rather than the norm. As stated by some of our nation's most experienced leaders, peace will be the exception in the future. Americans face a "new reality"—one that is significantly different from that of the Cold War. A conflict of irreconcilable ideas exists. Adaptive adversaries seek our demise by any means. Our own forces can't focus solely on future overseas contingencies but also must defend bases and facilities at home and abroad. Above all, because at least some current adversaries consider "peaceful coexistence" with the United States unacceptable, we have a foreseeable future of extensive conflict in which real peace will be the anomaly.

Today's Army is not designed for such a strategy; consequently, swift change is essential to survival in our new reality. As the Chief of Staff of the Army, General Peter J. Schoomaker, pointedly states, "We're going to have to [change] some of the things that made us the best Army in the world. Our values are sacrosanct. But everything else is on the table."¹

Accordingly, the Engineer Regiment must change—NOW. The fact that we provide a unique set of core competencies

that critically enable the combatant commander and the joint team with the mobility they need to provide a position of advantage at the tactical through strategic levels will not change. However, we must reexamine and challenge our most fundamental institutional assumptions, paradigms, and procedures to better serve our nation. We must be a campaign-quality, modular force with a joint and expeditionary mindset in order to adapt to unforeseen circumstances that will occur in the future. We'll retain the best of our current capabilities and attributes and develop others that will increase relevance and readiness to respond in the current and projected new reality.

Joint and Expeditionary Transformation Framework

One of the most essential pieces of transformation is "viewing all change processes through the lens of a joint and expeditionary mindset."² The Army's transformation efforts irrefutably must support operations in a joint environment, with an underlying interdependence among all services down to the tactical level to maximize complementary effects. Additionally, the uncertainty as to where we deploy, the probability of a very austere operational environment, and the requirement to fight on arrival throughout the battlespace pose an entirely different requirement—the fundamental distinction of expeditionary operations. The Army's new framework of how we organize *echelons of command*, *maneuver units of action* (UAs) and *support units of action* (SUAs) clearly support such operations and provide the joint force commander the right capabilities at the right place and the right time.

The nature of modern operations requires that our echelons of command become more flexible than our current divisions and corps. Hence, the Army is changing its command structure from three echelons of command (divisions, corps, and armies) to two—*units of employment-tactical* (UE_x) and *units of employment-operational* (UE_y). Both echelons will be modular entities designed to employ a tailored mix of forces. The particular organization of Army forces will be based on the requirements of the joint force commander and the conditions in the theater. These commands will orchestrate tactical engagements into battles, major land operations, and even campaigns when designated as a joint task force.

Maneuver UAs made up of battalion-sized and company-sized subunits will be the principal means of conducting tactical engagements. The principal tactical unit of the modular Army—the combined arms maneuver brigade—will consist of three standard types. The first two types will replace task-organized formations inside today's divisions.

- Heavy (armored) UA
- Light (infantry) UA
- Medium Stryker brigade

These maneuver UAs will be approximately the size of today's task-organized brigades and will include battalion-sized combined arms maneuver, fires, intelligence and reconnaissance, and logistics subunits. In contrast to current divisional brigades, the modular force maneuver UAs will be fixed-base (table of organization and equipment [TOE]) units.

Along with the maneuver UAs that will operate under the command and control (C2) of a UE_x will be five brigade-sized SUAs that will provide modular, scalable, and tailorable effects to the maneuver UAs or operate independently given missions from the UE_x:

- Fires
- Reconnaissance, surveillance, and target acquisition (RSTA)
- Aviation
- Sustainment
- Maneuver enhancement (ME)

The ME brigade deserves critical attention because it is the conduit for engineer effects that support the UE_x above those embedded in the maneuver brigades. The ME brigade is designed as a shell headquarters to organize and control forces within the area of operations assigned to the UE_x but outside of the areas assigned to the maneuver UAs. This SUA has the secondary mission of controlling combat and combat support assets not committed to the fires, RSTA, aviation, and sustainment SUAs. Typically, the ME brigade will include a mix of engineer, chemical, civil affairs, and military police personnel. It also may control air and missile defense units when assigned to the UE_x. Depending on the scope of the operation, more than one ME brigade may be assigned to the UE_x. Figure 1 shows the Army's expeditionary modular force model.

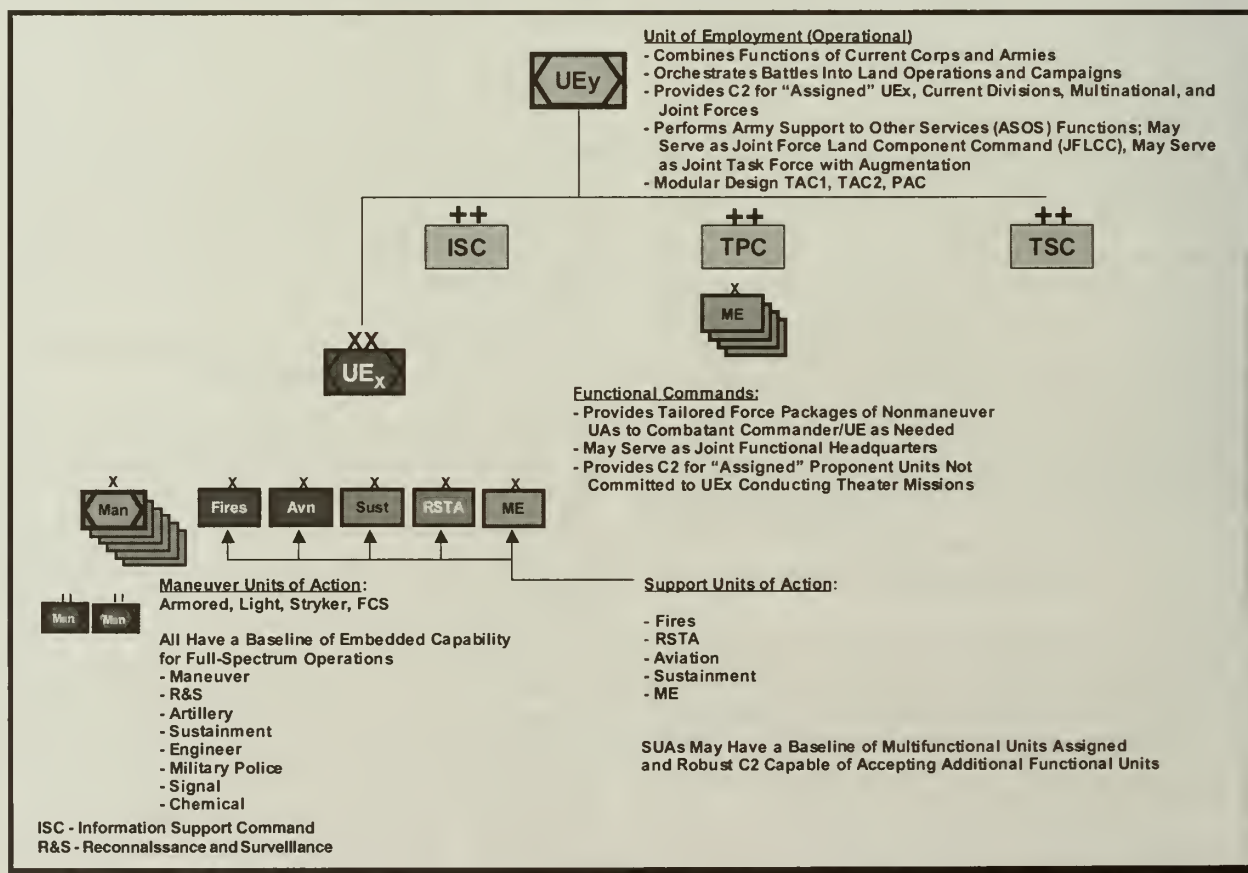


Figure 1. The Army's Expeditionary Modular Force Model

Transforming the Engineer Regiment

The framework of the future Army is the model for the Engineer Regiment's transformation efforts. The first installment of the Engineer Model clearly depicts a joint and expeditionary flavor and defines what engineers must bring to the fight and how. It is the starting point for partnering on organizational solutions, equipment, doctrine, standards, and training strategies. It also becomes the reference point for the discussion we must have on joint interdependencies—a practice we must embrace if we are to optimize our support to the joint force commander. This means taking a hard look at divesting ourselves of certain "traditional" Army engineer capabilities.

The Future Engineer Force facilitates the joint fight by supporting the five *joint functional concepts*:

- Battlespace awareness.
- Force application.
- Protection.
- Focused logistics.
- C2.

These concepts provide an overarching description of how the future joint force will operate across the *full spectrum of operations* (support, stability, defense, and offense). To enable the joint functional concepts, the joint engineer force must provide unique engineer capabilities to the joint force commander. These are referred to as *joint engineer capability*

elements. Figure 2 shows the relationship of the joint engineer capability elements to the joint functional concepts via the universal joint task list (UJTL) tactical and operational tasks, depicting how engineers have adopted the joint concept.

Equipment and organizations must be common for all engineer forces as much as possible. This allows interoperability and cooperative engineer engagements. It also enables efficient equipment acquisition and fielding and a significant reduction in logistics footprints for the entire joint engineer force. Common equipment is more sustainable, easier to manage from a joint force perspective, and easier to train for the entire joint engineer force. For example, if a bridge unit in the Marine Corps has the same modular design as that in the Army, and undergoes the same training as its brethren in the National Guard, the joint force commander has increased flexibility tenfold.

To ensure a complementary and interoperable mix across all components and services, we must engage the Joint Capabilities Integration and Development System process through the Joint Operational Engineer Board. This will ensure that we utilize a top-down approach, achieving interoperability while influencing the overall organization of joint engineer forces.

A critical characteristic of future operations—one that came early in our recent operations—is the requirement for the force to be able to execute across the full spectrum of operations simultaneously. In the past, our force design and time-phased force and deployment data (TPFDD) was based on a linear

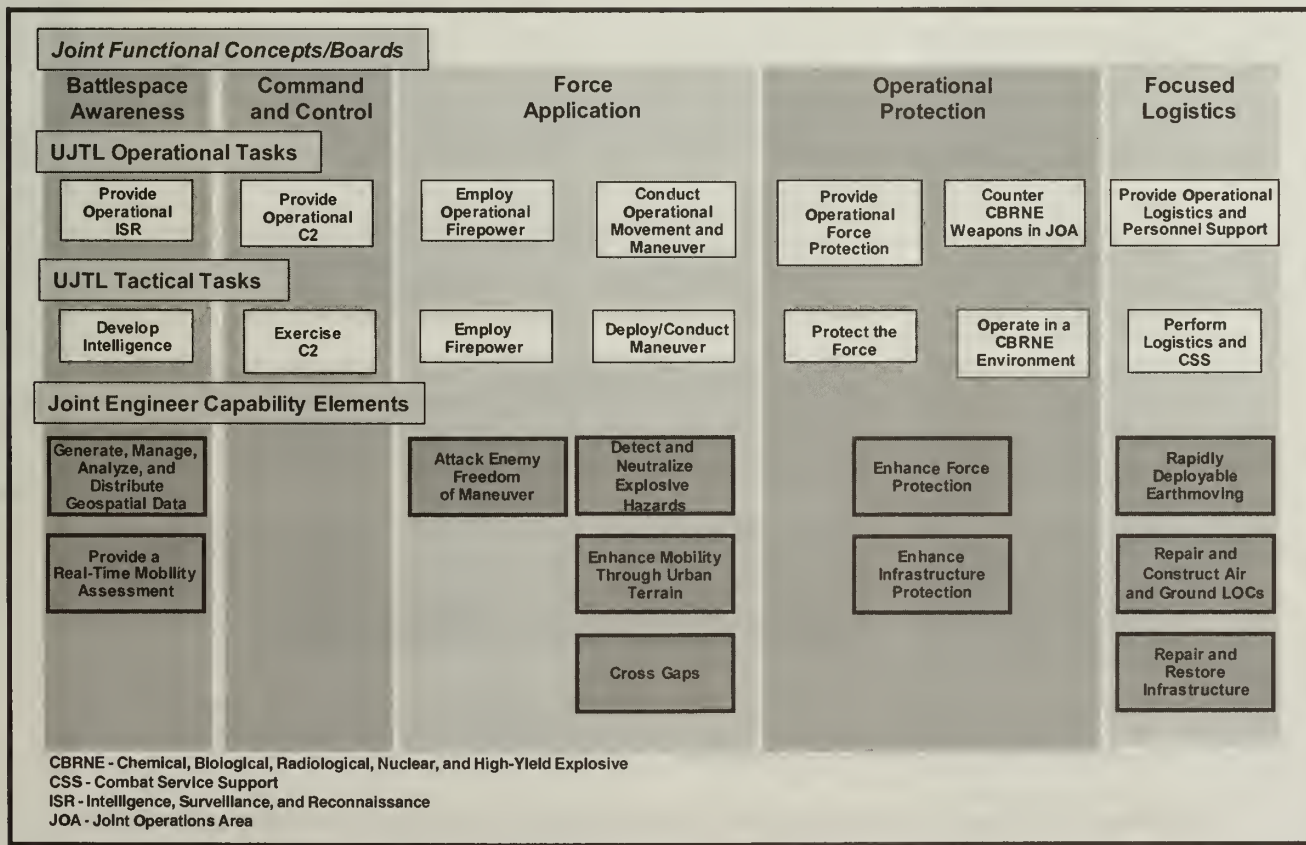


Figure 2. Joint Engineer Capability Elements

progression from defense, to offense, to stability—and rarely embraced support operations. Today, the model no longer fits.

Our formations must be capable of conducting rapid, decisive operations in part of the battlespace while executing defensive and stability operations in other areas. This “new” nature of operations is one of the primary drivers of a joint and expeditionary mindset. It demands a tailorable, scalable force and brings the joint commander a suite of capabilities that can be right-sized, mixed, and projected to meet the full range of operations.

Figure 3 depicts the range of capabilities that an expeditionary engineer force must be capable of bringing to the fight and how the premier capabilities change as the nature of the operations changes. Add the dimension of simultaneity—executing both offensive and stability operations in separate, noncontiguous areas—and one fully understands the challenge set, as well as some of the fundamental requirements from modularity that must be inherent in the Future Engineer Force design.

Engineer Organizational Concept

The Army’s framework of maneuver UAs, SUAs, and functional commands organized under two echelons of command—UEX and UEY—drives the Future Engineer Force framework. We must layer engineer capabilities in the same manner.

■ The first layer is an *embedded engineer capability* in the maneuver UAs, which is fixed. The embedded capability is either engineer forces or technology that is organic. The focus of these forces is the mobility of small-unit tactical formations. It is crucial that engineer C2 is an integral part of these elements.

■ The second layer consists of an *engineer force pool* of baseline forces (building blocks), mission module forces (specialized blocks), and an expeditionary engineer brigade C2 headquarters designed to support all echelons. It is the expeditionary force pool that gives the joint force commander the ability to tailor the force and react. This gives the force a full-spectrum capability and campaign qualities.

Baseline and Mission Module Forces provide the modular effects building blocks. Baseline forces provide two early-entry basic engineer capabilities—combat and construction. These elements can augment the embedded capability of the maneuver battalions or brigades. They are capable of receiving modules from the mission module forces for specific short-duration missions. Mission module forces provide engineer effects modules required by baseline forces to respond to specific changing missions. They consist of fixed organizations with discrete sets of capabilities.

Expeditionary Engineer Brigade C2 Headquarters will manage the training, certification, employment, deployment,

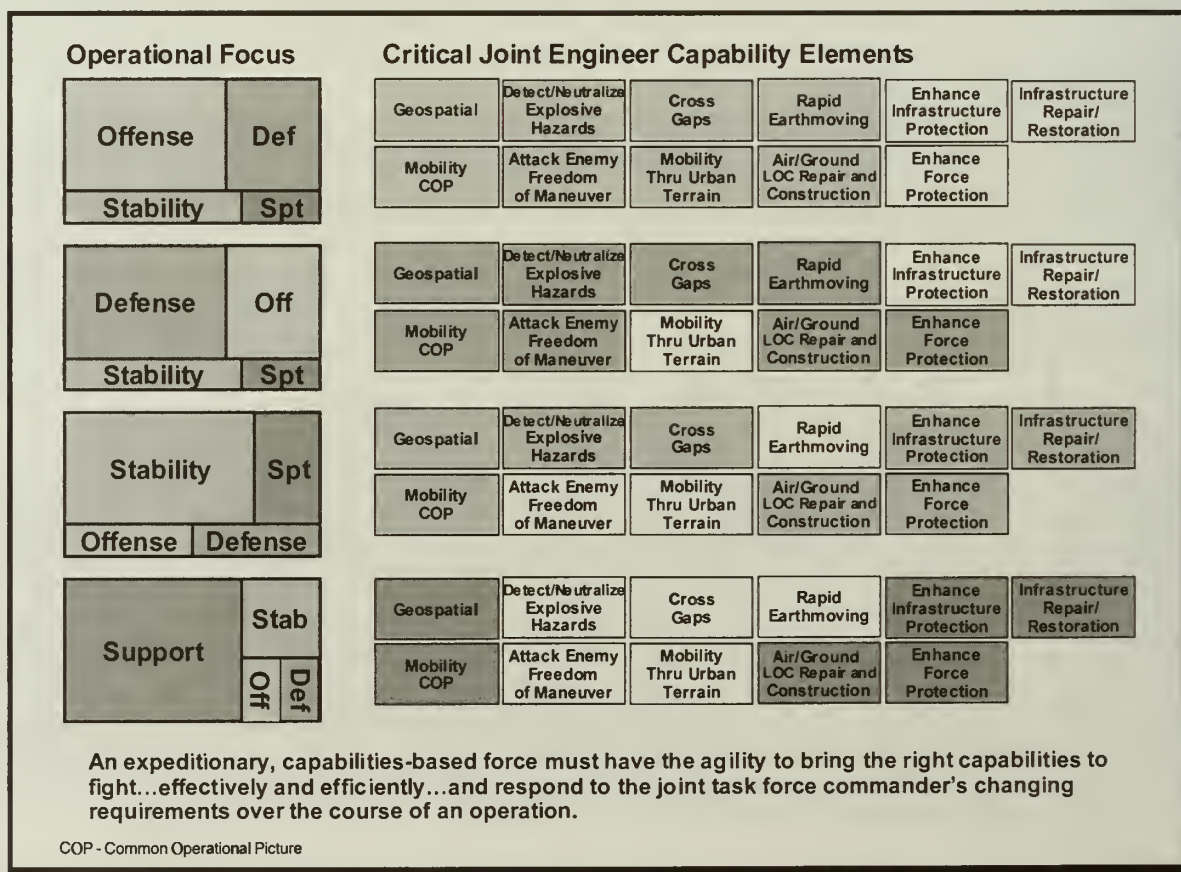


Figure 3. Critical Expeditionary Engineer Force Capabilities

and sustainment of engineer forces, both in garrison and operationally. It will provide operationally scalable C2 for the baseline and mission module forces. Engineer brigades become streamlined modular organizations able to command and control any combination of capabilities—Army, joint, or multinational. They will consist of network-enabled organizations that have separable, deployable command posts that are linked to home station operations centers (HSOCs) to minimize forward footprints that provide the rapid, early-entry, and sustainable C2 of engineer forces.

Engineer Employment Concept

An expeditionary mindset requires that we think of force employment differently than force structure. Although we will continue to have squads, platoons, companies, battalions, and brigades as a garrison structure that oversees training readiness, we won't employ wholesale garrison units—we will mission-tailor. The following paragraphs describe a framework of how we will employ forces (depending on the frequency required, integration required with other forces, where they will be positioned on the battlefield and when, and theater-specific conditions):

Engineer Effects Modules (EEMs) are the basic building blocks of engineer baseline forces and mission module forces. EEMs are narrowly focused, fixed organizations that train as a team to deliver discrete engineer effects. They do not have a C2 element. They are composed from engineer units, equipment contracts, and even full contracts. The commander will own the contract and execute it when required.

Engineer Mission Teams (EMTs) combine engineer effects to accomplish specific missions and fight engineer engagements. The C2 element is fixed and only capable of C2 for EEMs. EMTs are not designed to plan future operations. For example, there is a mission to clear and repair a route from Main Supply Route (MSR) A to MSR B to facilitate logistics. EEMs will consist of route clearance, rapid earthmoving, resurfacing, security, and initial line-of-communication (LOC) bridging elements. When combined, an EMT is formed.

Engineer Mission Forces (EMFs) are tailorable forces that orchestrate engineer missions, support maneuver operations, anticipate engineer requirements, synchronize engineer effects, and command and control engineer units at the tactical or operational level where necessary. They have the capability to integrate into Army or joint headquarters, and unlike EMTs, they are capable of simultaneous C2 and planning future operations. In the previous example, an EMF may be used to sustain the route clearance mission for an extended period of time, constituting a number of EMTs capable of planning future missions.

One of the fundamental shifts that an expeditionary mindset demands from leaders is the ability to separate garrison organization (optimized for training readiness) from employment organization. We do this today in the maneuver force. Garrison companies become companies and teams, and garrison battalions become task forces. We must have the

same mindset in the Future Engineer Force using EEMs, EMTs, and EMFs. These organizations do not have a set size; their use is tied to the scope and duration of their mission and the command/support relationship they have with the supported force. More importantly, it breaks the mindset of sending an entire company or battalion if there is a requirement. We must be more precise than that. We must send only what is needed, when it is needed, for as long it is needed—and nothing more.

Early Deployment Detachments (EDDs) are perhaps the most important feature of the Future Engineer Force framework. This element serves as an engineer assessment team that advises the commander on what engineer assets are needed and where, when, and how (EEM/EMT/EMF) to optimize them to best support the fight. Unlike our non-TOE tactical reconnaissance capabilities in the past, this element focuses on a technical reconnaissance TOE capability within our formations. It provides the force commander with engineer eyes forward, as it did in the past, but helps the commander develop engineer solutions before commitment using a reachback capability. It also enables the commander with a forward contracting capability to reduce the amount of assets that must be moved to the fight.

Given an operational scenario, an EDD is deployed into a theatre of operations. It determines the mix of forces required to support the operation. Based on the technical reconnaissance and assessments, it determines that one brigade-sized EMF is required. That EMF consists of three EMTs with a mix of twelve EEMs and two full equipment contracts. As the operation progresses, additional technical reconnaissance and assessments are conducted and the composition/number of EMFs, EMTs, and EEMs is adjusted to meet the changing requirements.

Complementary and Expeditionary Employment Concept

An expeditionary force design framework demands a complementary expeditionary employment concept. This also must fit within the Army framework of how forces will be employed. It presumes that UE headquarters are standalone and do not require plugs from engineer subordinates. It also presumes that engineer forces will use the combination of theater protection commands (TPCs); and ME brigades as the primary conduit for projecting forces into theater and to the UEx. In some instances, missions may be so engineer-specific that the multifunctional capability of the ME brigade headquarters is not an optimal match. As a result, an engineer brigade may be assigned directly to a UEx.

The Future Engineer Force will be dynamically employed, enabled by its agile and modular design to meet the needs of the warfighter and the combatant commander. Combinations of expeditionary engineer C2, baseline forces, and mission modules will form EMTs and EMFs to support the two echelons of command—UEy and UEx (see Figure 4, page 12).

As depicted in Figure 5, page 12, engineers in the UEy will be allocated to the TPC based on mission requirements. EMTs

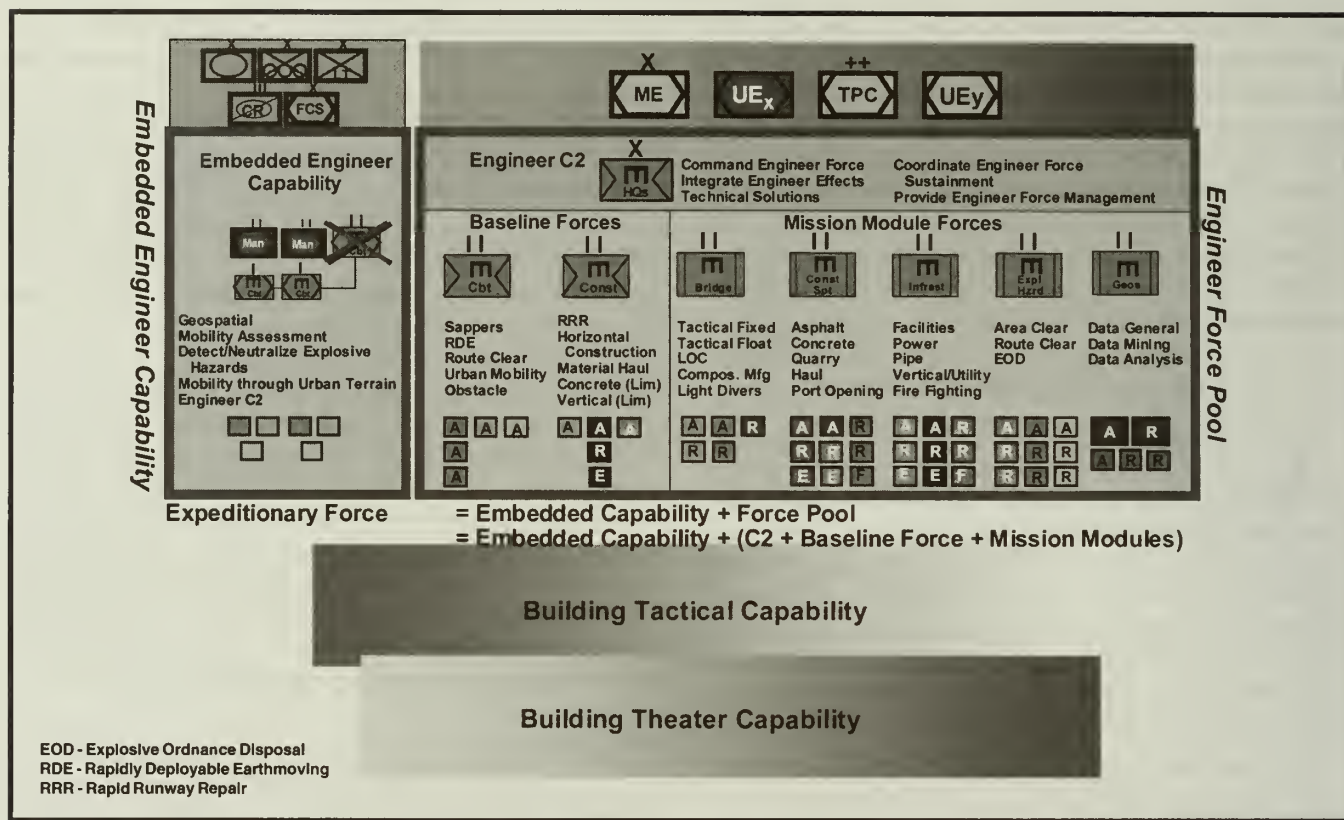


Figure 4. Future Engineer Force Framework

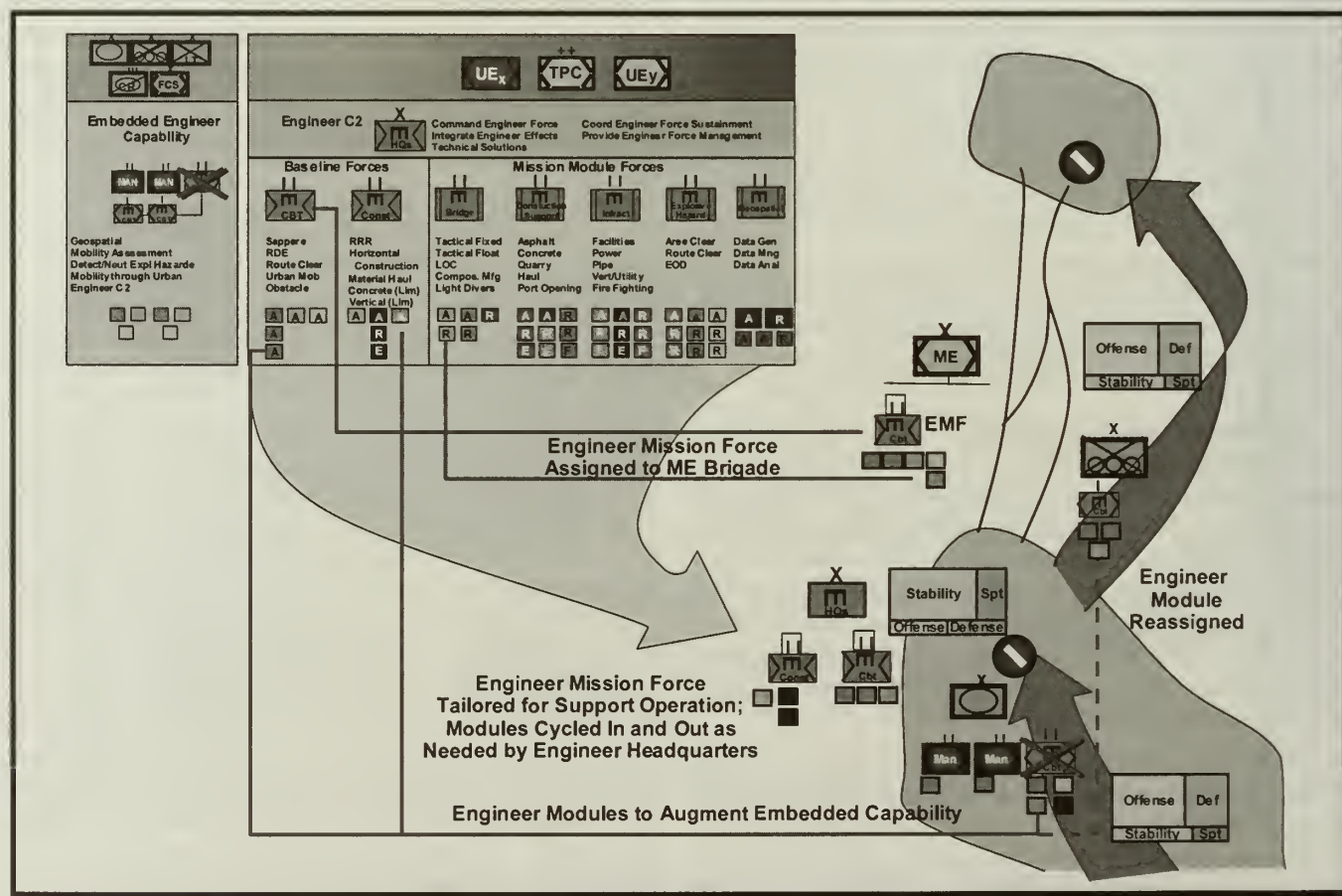


Figure 5. Force Design Theory Applied

To meet the needs of the UEx and its subordinate UAs, the TPC will form a tailored ME brigade. The expeditionary engineer brigades from the TPC will create EMFs, tailored to the specific needs of the UEx, and allocate them to the ME brigade. As required, EMTs or individual EEMs will be pushed from the ME brigade to other SUAs in the UEx or to augment the embedded forces in the maneuver UAs to conduct short-duration missions. As with the engineers assigned to the TPC, EEMs and EMTs will rotate in and out of the ME brigade based on changing mission requirements (see Figure 6).

The plan to convert the current structure to joint expeditionary units that are more deployable, employable, modular, and sustainable demands a comprehensive relook of the roles and structure of the Active Component and Reserve Component. As stated by General Schoomaker, "We need to examine what we have in there and what we need."³ The Army is thus reviewing 100,000 positions to redress the balance—especially for the early days of a conflict.

Reserve Officers Association meeting, 23 January 2004



It is likely that changes required in our Reserve Component organizations will match or exceed those in the Active Component. Some of the engineer capabilities that reside predominately in the Reserve Component may need to be shifted to the Active Component and vice versa. The Army's Active Component will provide rapidly responsive, agile, and expeditionary forces that typically respond in the first thirty days of an operation. The Reserve Component will provide strategic depth to reinforce the warfight. They will also conduct stability operations and support operations (SOSO) and lead our efforts to protect the homeland.

The Active Component will provide the embedded early-entry capability in the maneuver UAs to meet the immediate needs of the warfighters. They will also initially provide the baseline/foundation capabilities (C2, combat engineers, and construction) that are required above the embedded capabilities in the maneuver UAs and those required by the combatant commander. The USAR will provide effects-based modules to augment the baseline forces to provide the breadth of required engineer capabilities. The ARNG will continue to lead homeland security efforts and augment when and if needed by the Active Component and USAR. Secondary to that effort, they will provide the strategic depth of foundation capabilities to support major combat and SOSO on a rotational basis. The USAR will sustain the provision of effects-based modules to the ARNG baseline forces to sustain the breadth of engineer capabilities.

Force Management Concept

The default condition of our operational environment has become one of continuous conflict. Major portions of our Army will repeatedly be deployed and employed. As a result, the senior leadership of the Army has recognized that we must alter our force management practices to reduce turbulence and account for the strain that more frequent deployments will have on force modernization efforts, soldiers, and families. They have designed three stabilization models that aim to achieve continuity in training, stability of leadership, unit cohesion, enhanced unit readiness and combat effectiveness, and greater deployment predictability for soldiers and their families.

One initiative requires that soldiers, both enlisted and officers, report to an installation and remain on that installation through their time as a squad leader or company command equivalent. They will attend the Basic Noncommissioned Officer Course or Captain's Career Course and return to their home station. This improves stability and predictability and is the stepping-stone to life cycle unit manning.

Another initiative allows leaders and soldiers to assemble, train, and employ together throughout the unit's operational cycle. This forms the basis for rotations of fully deployable units while increasing stability and cohesion. This also results in more depth of experience and increased family stability and predictability. Embedded engineer units will be managed in

this manner in conjunction with the maneuver UA to which they are assigned. Baseline engineer units will also be managed using this approach. Individual engineer brigades and their assigned baseline engineer battalions enter the cycle simultaneously. Leaders and soldiers assemble and conduct training and certification. The brigade is not available during much of the train and release phases. Once certified, the brigade and its subordinate units are then allocated to the TPC for employment. As needed, the engineer brigade or its subordinate elements are deployed to support ongoing operations, peacetime military engagements, or deterrence on a rotational basis. Once the employment phase is completed, the brigade and its subordinate battalions enter the release/rebuild phase. During this phase, the preponderance of the unit is released and reassigned to other units. A core cadre of personnel remains to receive replacements and the brigade reenters the train phase to begin the cycle again.

The final initiative is the most effective method for sustaining units and mission module forces. The unit, once manned, enters a continuous sustain-employ-sustain cycle. Leader and soldier assignments are synchronized with sustainment phases. During sustainment phases, the unit experiences a 15 to 30 percent turnover of personnel. This model is used since most of these mission module forces are low-density, high-utility skill sets. This reduces the inflow and outflow of personnel units to very discrete time periods. Mission module force engineer brigades will offset the employ and sustain phases of assigned mission modules, and perhaps battalions, to ensure that they continuously maintain a full array of ready and deployable mission modules.

Each of the force management concepts ensures that the Future Engineer Force is capable of providing the full range of required engineer capabilities. The engineer brigade remains the cornerstone of force management.

The role of the Engineer Commands (ENCOMs) is significantly more multifunctional in the new force management concept. They will be responsible for training readiness of the engineer forces, will decide what force is "in the ready rack" and which unit will be deployed, and could work for the UEy commander as a joint deployable headquarters. All around, the new force management concept will allow for the utmost flexibility.

Achieving the Vision

Achieving the future vision discussed in this White Paper may seem like a time-consuming and lofty goal. But we owe it to past, present, and especially future engineers to design a way ahead that is achievable, realistic, and timely.

Our initial effort will be the establishment of an expeditionary force pool that is capable of supporting the entire joint force. With this effort, we will challenge the C2 structure as we know it today and convert groups and corps engineer brigades into

expeditionary engineer brigades that will be capable of commanding and controlling the baseline engineer battalions, other service engineer forces, and even other proponent forces, if required.

The role of baseline engineer forces is to enhance the engineer capabilities of the maneuver UAs. This baseline force pool will consist of two early-entry basic engineer capabilities—combat and construction. The new design will impact the Active Component as well as the Reserve Component structure. As part of this initial effort, we must rethink how we train and equip these baseline battalions so they can respond quickly to specific changing missions. This change will involve training from initial entry to command preparation. These mission module forces will be fixed organizations with a discrete set of capabilities. To improve the way our forces are equipped, we will step up efforts to procure modern and common construction engineer equipment so that the Active and Reserve Components are identically equipped. Additionally, we are studying how to put more of the decisions on leased equipment at the commanders' level. Our leased equipment must be consistent with sister service lease agreements so we come closer to commonality of engineer capabilities.

A simultaneous but supporting effort in achieving our vision is to accelerate the enablers of the embedded engineer forces. We will improve, through training and procurement, how our forces detect and neutralize hazards. We will ensure that our engineer soldiers are placed on platforms that are as survivable and mobile as the maneuver UAs they support, by designing capabilities for the FCS that are consistent with our capabilities environment. This supporting effort will also include finding new ways to train and fight in urban terrain so that engineers are the first soldiers called when a unit approaches a built-up area. Our modular design will allow us to have a just-in-time assault bridging capability that allows the maneuver UA commander to maintain momentum in any environment.

These monumental changes in the Engineer Regiment call for new management techniques that allow an organized approach to providing engineer forces to the joint force commander. We will accomplish this through a force management system where ENCOMs are responsible for tracking the unit readiness and deployability of every engineer unit assigned to their regional alignment. We envision two and possibly three ENCOMs under the purview of the U.S. Army Corps of Engineers that provide forces through U.S. Army Forces Command to a joint force commander. This concept could include an ENCOM responsible for forces capable of responding to homeland security issues.

Last, but certainly not least, in this effort to transform our Regiment is the dialogue with our sister service engineer forces. The end state of all our efforts is the "Color Purple." Our senior leaders must begin discussions now with other service leaders on accomplishing commonality in equipment and

"The joint force, because of its flexibility and responsiveness, will remain the key to operational success in the future. The integration of the core competencies provided by the individual services is essential to the joint team, and the employment of the capabilities of the Total Force (active, reserve, guard, and civilian members) increases the options for the commander and complicates the choices of our opponents."

—Joint Vision 2020

training and interdependency in mission sets. The end state is an engineer force that is fully integrated, expeditionary, networked, decentralized, adaptable, decision superior, and effective.

The Future Engineer Force . . . Relevant and Ready



This article was a joint effort of members of Engineer Concepts, Engineer Division, Directorate of Combat Developments, Maneuver Support Center, Fort Leonard Wood, Missouri:

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Endnotes

¹ The Way Ahead, 26 November 2003.

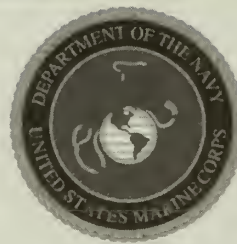
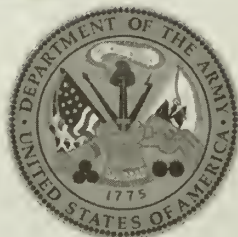
² "An Army at War - A Campaign Quality Army With a Joint and Expeditionary Mindset (Draft)", 17 February 2004.

³ General Peter Schoomaker, 8 January 2004.

Reference

Unit of Employment (UE) Operations White Paper, Version 3.0, 5 March 2004.





Joint Engineer Training

"I'm not surprised to find out that your Navy has its own Army, but I am surprised to find out that your Navy's Army has its own Air Force."

—Israeli officer undergoing Joint Professional Military Education at Command and General Staff College

"Our Navy's Army has its own engineers too."

—Engineer officer's reply

Here's an interesting thought. In Europe, we send engineer captains to courses to introduce them to the engineer formations, capabilities, procedures, and doctrine of fellow NATO countries. Yet there is no such training for our engineers on the other services of our own country. The point is not that we should eliminate the training at the Euro-NATO Training Engineer Center. The point is that we do more training on NATO engineer procedures than we do on our sister services.

This article opens the issue of joint engineer training, with four authors—with very different backgrounds—providing thoughts on it. We have viewpoints on how we do business now, what we saw during Operation Iraqi Freedom, what implications we see from that, and what we see coming tomorrow that will define the joint engineer training environment.

Joint Training Today

By Colonel Thomas E. O'Donovan

Today the primary vehicle for joint engineer training is found in two places. For leaders, we have embedded joint training in the programs of each service (Figure 1). That training is limited to general understanding of other service organizations and capabilities.

For example, Army lieutenants get two to three hours of joint training in the basic course, including an overview of concepts such as joint doctrine and organizations, and a brief introduction to joint fires. Captains in the career course get five to seven hours about the organizations, functions, and capabilities of Air Force, Navy, and Marine Corps engineer assets. Noncommissioned officer training has a similar structure and content. Additionally, we train about eight Marine Corps

officers annually in the Engineer Captain's Career Course and have a Marine Corps officer on the faculty at the U.S. Army Engineer School. But until an officer reaches field grade rank and begins Joint Professional Military Education (JPME), there is no other joint engineer training, and JPME includes very little engineer training.

For enlisted training, we have the Interservice Training Review Organization (ITRO) system and all three forms (consolidated, unique, and colocated) train enlisted engineers. For example, Army firefighters train at an Air Force school. This program was a long time in development, has been in

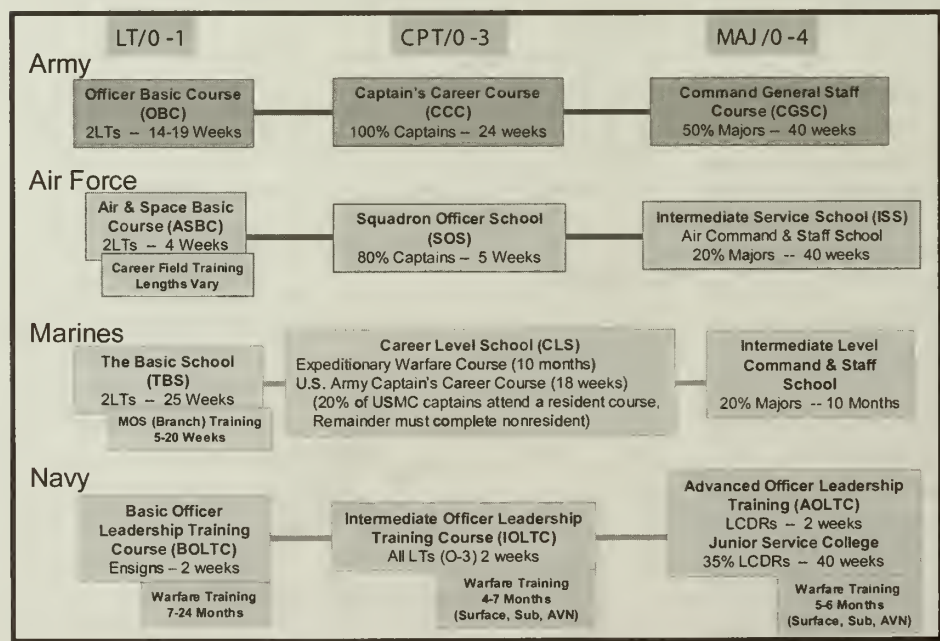


Figure 1. Officer Education Timelines for the Services

action since 1996, and is described in more detail in *Engineer*, February 2000, page 11.

The bottom line is that we conduct some leader joint training and common enlisted training. But does it achieve the "jointness" required for tomorrow? If not, what are the key pieces today's joint training is missing? We'll look at what joint engineering meant in Operation Iraqi Freedom and what it will mean in the future and then come back to that question.

Joint Engineer Training Aspects of Operation Iraqi Freedom

By Colonel Charles Smithers

The joint fight is with us to stay and there's no looking back. For years we've schooled on it during training events and contingencies, but it matured during major combat operations of Operation Iraqi Freedom. It's no longer good enough to stay in your "service" lane—it's time to be better and develop applicable skills to employ everything—and everyone—that comes to the fight. Joint engineer vision is driven by concepts being implemented now. In Operation Iraqi Freedom, today and in its earlier combat phases, joint engineer skills are a key part of the success.

As we look across the services at doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF), what do we "jointly" grab that will be the catalyst for joint engineer efforts? As we saw in Operation Iraqi Freedom, most of the components of DOTMLPF are different. But leader development is the common component—engineer leaders who will lead the way as we learn and put our new joint engineer skill into practice.

A model for developing this skill comes from Department of the Army Form 67-9, *The Officer Evaluation Report*. The "Skills (Competence)" section for assessing leaders rates technical, tactical, conceptual, and interpersonal attributes. Consider the tenets of breaching operations—suppress, obscure, secure, reduce, and assault (SOSRA)—and analyze them according to those attributes. Our formations, and we as leaders, are technically trained in each step. We apply that training to the tactical situation using mission, enemy, terrain, troops, time available, and civilian consideration (METT-TC). We conceptualize with judgment and critical thinking, while exercising interpersonal skills to communicate, teach, motivate, and lead.

Nothing is different in joint operations as it relates to skill and skill development. Operation Iraqi Freedom lessons learned by our engineer battle staff relating to this skill can easily be broken down using the model above. For example, at the beginning of ground operations, Coalition Forces Land Component Command (CFLCC) had three Marine Corps multirole bridge companies (MRBCs), one British M3 bridge company, and four Army MRBCs to assure mobility of ground forces as we attacked north to Baghdad. We allocated these

critical bridging assets against the respective V Corps and 1st Marine Expeditionary Force (1MEF) missions. This bridging allocation plan received the highest level of attention, because without success in tactical bridging operations, the entire ground campaign could have been at risk. We found tremendous similarities between Marine and Army equipment, organization, operations, and training. Call that joint interoperability.

As integral members of the joint team, we had five Marine Corps officers on our battle staff, along with a Navy Seabee and an Air Force engineer. Before the start of the ground campaign, as we taught each other (interpersonal) about the capabilities and limitations of our materiel (technical) and the intricacies of our doctrine (tactical), we spent countless hours synchronizing (conceptual) our bridge plan to make sure it was right. It had to support the CFLCC plan and get the force quickly to the Iraqi Center of Gravity—Baghdad.

It came as a surprise to all the Army planners involved when we discovered toward the end of months of planning that though the three Marine MRBCs were ready for the fight, they were loaded on ships, but had only one set of bridge trucks, not three complete MRBCs as we knew them. What did that do to our plan? Where would we get CH-47 Chinook helicopters to sling bridge bays instead of ammunition forward in the zone? Where would the forward bridge park go, and who would secure it while the bridge crew built the bridges? What truck assets would be available when we needed to move the bridge bays?

Did we fail? Certainly not. But in a more time-compressed planning situation, or if the enemy had been successful in destroying fixed bridges, we would have had significant challenges to overcome. We didn't show the same inherent skill with this situation as we did with the SOSRA example. Maybe it was a harder problem, but the lesson learned was that we had to apply the same skill set—but with a joint engineering flavor.



Army engineers provided extensive support to the Marine Corps in Operation Iraqi Freedom, including the attachment of multirole bridge companies.

We also learned about command and control arrangements and how the different services really interpret and implement them. Changing task organizations between Army and Marine formations during the fight was tough. We discovered what it means to move an Army MRBC with 54 bridge trucks and other assorted vehicles from V Corps across the CFLCC zone to the IMEF, rather than on paper or in a computer. And finally, we learned that with the speed of the battle and its ever-changing, ever-increasing requirements, we needed inherent joint skill to pull this and many other joint engineer challenges together.

So what are our key conclusions? Service engineers in a joint context must obviously be proficient in the skills of their service, but must also be joint skill-capable. The model above for establishing joint skill works, but we must get better at it because learning it in-theater is not a good approach. We may not have as much time to get it right when we do this again.

We can get there. In fact, recognizing that fact and talking about it begins the journey. The application of our model, using our four words above—interpersonal, technical, tactical, and conceptual—is critical. We must know ourselves and be able to employ our assets in any environment—our service engineer skill. But we must also know what's available and how it is employed in the other services. That's the power that makes us better than our opponent—our joint engineer skill.

Joint Doctrine Developments

By Lieutenant Colonel Reinhard W. Koenig

Can joint doctrine fix joint training and operational issues like those described above? Aren't we first supposed to look at the "D" in DOTMLPF for solutions? The answer is a qualified "yes" to both questions. As we look more to joint solutions in operations and training, the qualified "yes" should become much less qualified. Joint transformation implies a shift in the way we conduct unified action and in the way we train. It therefore requires changes in doctrine that will drive further changes in training, leader development, and even materiel development. Joint engineer doctrine clearly will need to transform as the force undergoes fundamental changes as part of that transformation.

Joint Publication (JP) 3-34, *Joint Doctrine for Engineer Operations*, is the overarching publication for planning and synchronizing the engineer effort in unified action. JP 3-34 is now being revised and will be combined with JP 4-04, *Civil Engineering Support to Joint Operations*, with an estimated publication date in 2006. JP 3-34 establishes the engineer battlespace functions of combat, topographic, and general engineering and directs the engineer effort to use these functions to help the joint force achieve assigned objectives and end states. The combat engineer function is further defined as mobility, countermobility, and survivability. JP 3-34 also guides planning, establishment of engineer staff organizations, and conduct of engineer operations. This manual extensively

addresses the capabilities of each service's engineer organizations and how to integrate them into the operational plan of the joint force commander. Intimate understanding of this doctrine is required for a joint engineer officer to be successful, yet we do little or no training on these concepts.

JP 3-34 reflects and suffers from the way services now train and equip their engineer forces. Current engineer formations are structured to support the specific needs of their particular service, not the joint force, in an operational environment. This limits the ability of the joint force commander to focus engineer efforts at the time and place of his choosing. Joint engineer doctrine also recognizes the service Title 10 requirements that must be satisfied outside the joint environment. Ultimately, JP 3-34 is an effort to deconflict service requirements and at the same time gain synergy from various service capabilities. JP 3-34 is a manual that all services can live with, but it does not place the requirements of the joint force commander at the forefront, so it is going to change.

Unlike the past, when requirements were service-generated, the Joint Capabilities Integration and Development System (JCIDS) is now top-driven by the needs of the joint force and will drive doctrinal and other changes. The outlines of those changes are seen in current efforts to establish the needs of the joint force (Figure 2, page 19).

Engineer force developers from all services analyzed the established Joint Functional Concepts at the top and cross-walked them with the operational and tactical tasks in the Universal Joint Task List to establish the Joint Engineer Capability Elements (JECE). These codify the discrete warfighting effects that engineers from all services should provide to the joint force commander at all levels and throughout the spectrum of operations. Engineer DOTMLPF solutions need to focus on requirements established through analysis of these requirements. It is reasonable to assume that in the future, resourcing that does not address these needs is unlikely to be fulfilled.

The effect of the JCIDS process on future joint engineering doctrine, although unclear now, will be profound. Unlike current joint engineer doctrine, which gives the concepts of employing service assets in the joint fight, future engineer doctrine will assume much greater interdependence among the services. We will likely maintain an overarching set of joint engineer doctrinal principles, but doctrine will direct how each service will specifically support the joint force commander through application of the JECEs. For example, cross-service modularity of engineer capabilities will further increase the joint force commander's ability to employ engineer assets as needed, and doctrine will reflect this increased capability. Ultimately, these changes will give the joint force commander more options to employ joint engineer forces, because he will be focused on the desired effect and apply an engineer module to achieve that effect. The service providing the module should be transparent to the warfighter. This has tremendous implications for joint engineer training.

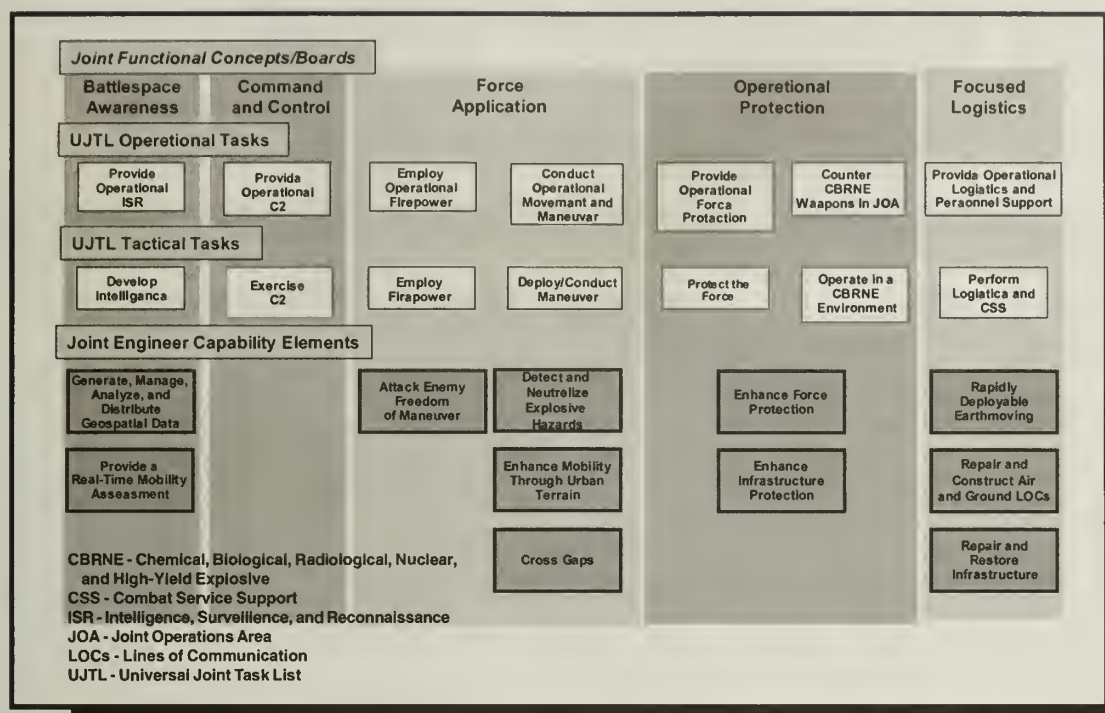


Figure 2. Top Down Crosswalk—Joint Functional Concepts to Engineer Capability Elements

Joint Officer Education of the Future

By Commander Steven C. Fischer

Engineer capabilities are in high demand, engaged in operations in Afghanistan and Iraq while supporting combatant commander theater engagement plans, routine training, and garrison support missions. To meet these challenges, the services have developed force rotation plans in which engineers perform missions traditionally executed by engineers from sister services. This is not only a challenge for the unit on the ground, it has also proven to be a challenge to engineer planning officers assigned to joint task force and combatant commander staffs. Most personnel newly assigned to joint engineer positions have little knowledge of engineer capabilities beyond their own service, limiting their effectiveness until they acquire experience on the job. Operation Iraqi Freedom showed this problem, but it isn't new.

Except for intermediate service schools, junior field grade engineer officers have few formal education opportunities to prepare them for joint engineer operations. Also, JPME has little or no engineer content. By default, most officers assigned to joint task force and combatant commander engineer staffs initially rely on their own experience and self-education. This clearly presents a steep learning curve before officers can contribute effectively by providing options and recommendations and implementing them in a joint engineer environment. An after-action review from Operation Iraqi Freedom noted, "Early planning efforts within the C7 (staff engineer section) were hampered by a lack of knowledge of capabilities, requirements, and limitations of other service and coalition engineer forces, particularly among junior members

of the staff. Action officers are often junior field grade or company grade officers who do not have sufficient joint engineer education or experience to be effective at the beginning of their assignment." To provide the combatant commander with options to meet their requirements, it is critical for engineers in a joint environment to fully understand the capabilities of each component engineer force.

The Joint Staff, J4 (Logistics Directorate) sponsored an engineer capabilities study that examined this and other issues in detail. Involving the participation of the engineer community throughout the services and combatant commanders, the study concluded that the lack of formal education in joint engineer operations limits the ability of engineer officers to integrate their services' capabilities into missions involving joint engineer planning and operations. The study recommends that engineer officers be introduced to joint engineer operations earlier in their careers to prepare them for service with a combatant commander, joint task force, or other joint staff.

As recommended in the study, a general officer/flag officer forum—the Joint Operational Engineering Board (JOEB)—was established. The JOEB, which first met in January 2004, is the premier advisory group and proponent for operational engineering issues. Composed of senior logisticians and engineers from the Joint Staff, services, and combatant commanders, the JOEB is chartered to serve as a "board of directors" overseeing efforts to enhance joint engineer processes and capabilities to meet combatant commander requirements. One of the JOEB's first actions was to create a Training and Doctrine Working Group to address joint engineer training. This group is now organizing, prioritizing issues, and developing action plans.

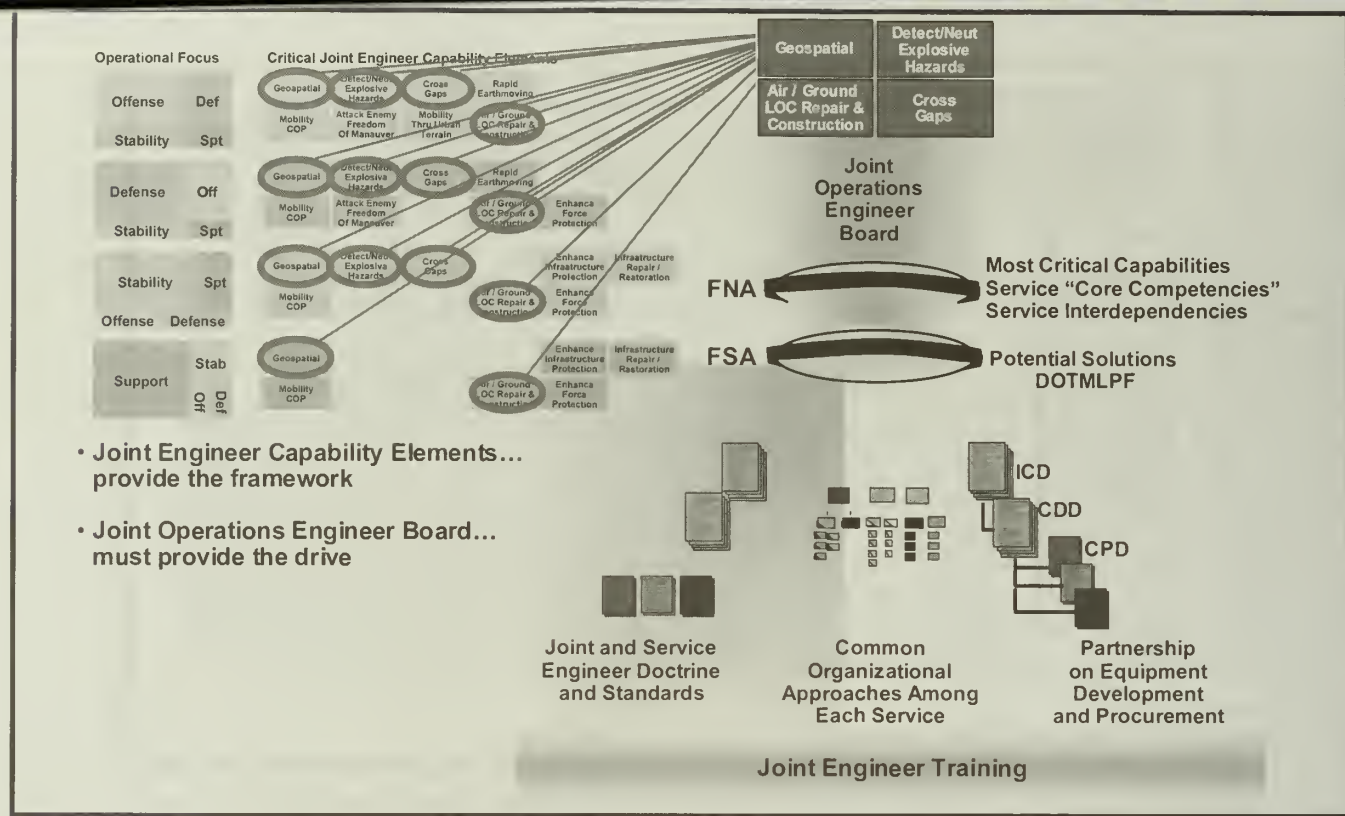


Figure 3. The Work to Be Done...to Fully Realize the Joint Engineer Vision

In the coming months, this working group will coordinate the details of putting together a joint engineer officers curriculum. Considerations include the following:

- At what level of professional development should joint concepts be introduced to the engineer officer corps?

- What skills do our combatant commanders expect in their engineer officers?
- Do we need a basic and/or an advanced training version?
- Will it be Web-based, taught in residence, or both?
- Where will it be taught, and by whom?

While these may be difficult questions, the joint engineer community should begin training officers to more effectively serve as joint engineers by fiscal year 2005.

Jointness used to mean "deconfliction"—ensuring sister forces weren't stepping on each other. Today jointness means services working together to ensure interoperability. At the staff level, that has been implemented through service officer representation. Tomorrow, jointness may mean interdependence, and that means leader responsibility for implementing joint engineering on the battlefield. In that evolving context, several things are clear:

- We must ensure that the hard-won lessons of today's operations are not lost.
- We must work to ensure that the leaders who will implement the joint engineer concepts of tomorrow are developed today.
- We must train our leaders and develop our doctrine to ensure that such joint approaches are implemented to accomplish the mission given to us by the National Command Authority.

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Lieutenant Colonel Koenig is chief of the Doctrine Development Division, U.S. Army Engineer School, Fort Leonard Wood, Missouri. He previously served with the 326th Engineer Battalion, 101st Air Assault Division, Fort Campbell, Kentucky, and most recently in Korea.

Commander Fischer, Civil Engineer Corps, U.S. Navy, is a staff officer in the J4 Engineering Division of the Joint Staff. He previously served operational tours with the 3d Naval Construction Brigade, Naval Mobile Construction Battalions 62 and 74, and as a Logistics Civil Augmentation Program (LOGCAP) contract administrator in Somalia during Operation Restore Hope.

FORGING OUR FUTURE —

USING OPERATION IRAQI FREEDOM PHASE IV LESSONS LEARNED

By Lieutenant Colonel Reinhard W. Koenig

About a year ago, U.S. Army engineers crossed the line of departure for Operation Iraqi Freedom as members of a joint and multinational team. Immediately, and throughout the operation, they provided assured mobility for the force—breaching the berms at the Kuwaiti-Iraqi border, bridging gaps, reducing minefields, mitigating explosive hazards, providing an endless supply of geospatial products, constructing and repairing lines of communication, repairing airfields, and performing numerous other missions. Perhaps just as important, engineers executed their secondary mission of fighting as infantry, often as a primary mission.

To capture the myriad of lessons learned, the Engineer Regiment produced a draft after-action review (AAR) for Phases I through III and presented it at the Warfighter track of the Society of American Military Engineers Regional Conference in Savannah, Georgia, in November 2003. (See *Engineer*, October-December 2003, page 19.) Based on input from that conference and from across the Regiment, the U.S. Army Engineer School formed a doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) integration board to review each issue and formulate actions to resolve them. Solutions are being developed to address both short- and long-term challenges for the Regiment. While not all problems are easily solvable, it is important to note that approximately 50 percent of the issues

from a similar effort in Operation Desert Storm were resolved before Operation Iraqi Freedom.

The transition from Phase III (decisive) to Phase IV (stability) operations is sometimes unintentionally portrayed in doctrine and training scenarios as smooth and easy. Experience in Operation Iraqi Freedom shows this is far from the truth. Some units that violently executed offensive operations suddenly, and in some cases immediately, found themselves supporting humanitarian relief operations, then rapidly returning to the offensive. Even today, it can be argued that engineers are simultaneously executing Phase III and IV operations. Engineers may be tasked to conduct cordon-and-search missions under combat conditions one day and provide construction support for schools and hospitals the next day. The last two issues of this publication included important articles that gave insights to the missions, challenges, and solutions of Phase IV. But given the additional complexity and the great challenges sappers in theater have met, it is time to begin compiling the Regiment's AAR for Phase IV. This will allow us to initiate the DOTMLPF solutions process the same way we are doing for Phases I through III.

During ENFORCE 2004 (26-30 April) the Engineer School will host a breakout session to begin to compile and analyze Phase IV issues. Individuals are encouraged to attend this



(Phase IV - Stability Operations)
Soldiers from V Corps's 18th Military Police Brigade and 94th Engineer Battalion join an Iraqi policeman and contractor to cut a ribbon, celebrating the renovation of the Al-Jazaar Police Station in downtown Baghdad. The project was a collaborative effort between military police, engineers, and Iraqi police and contractors.



(Phase IV - Return to Combat Operations) Engineers assigned to Alpha Company, 1-32 Infantry, 10th Mountain Division, use a breaching device to gain entrance to the building during a daytime raid of a shop suspected of producing and selling anticoalition CDs and DVDs in the town of Al Fallujah.

session to shape the discussion. If you cannot attend ENFORCE, please submit input on the issue, discussion, and recommendation format to [<doctrine.engineer@wood.army.mil>](mailto:doctrine.engineer@wood.army.mil) for inclusion in all discussions. At the breakout session, we will have Colonel James (Jim) Greene, the engineer representative from the recent Center for Army Lessons Learned Operation Iraqi Freedom Combined Arms Assessment Team. Colonel Greene spent most of February in the area of responsibility, collecting information that will help guide the discussion.

Specific topics are being solicited and developed for the breakout discussion. The following areas are important to address:

- What lessons on modularity, Active Component/Reserve Component rebalance, and the joint and expeditionary mindset did we learn during Phase IV that should shape the road ahead for the Future Engineer Force?
- What geospatial products were useful during Phase IV, and how can our capabilities for this battlespace function be improved?
- What training for soldiers and leaders at home station and in the training base should be sustained or improved?
- The Regiment employed the 1138th Engineer Battalion (Missouri Army National Guard) as the Mine and Explosive Ordnance Information Coordination Center (MEOICC). What are the "sustains and improves" of this structure?
- Field force engineering was a huge success. How should the Regiment shape this capability for the future?
- Nation building is a major aspect of current operations. What have we learned and what actions do we need to take in the future?
- Base camp development was a major challenge for the Regiment. What worked and what did not?

- Engineers encountered explosive hazards, to include improvised explosive devices, on a massive scale. They quickly adapted to this dangerous environment and the associated missions. What actions should we take based on this experience?
- As part of this effort, engineers participated in one of the largest transfers of authority in history. What lessons should we take from this experience?
- What engineer equipment was useful during Phase IV? What equipment did not meet expectations, and how can we improve it?
- What are the joint aspects of Phase IV operations that have proved to be effective, and which need to be improved?
- What unit reports, histories, stories, and articles have been prepared and need to be submitted for analysis; archiving; lessons learned; doctrine; and development of tactics, techniques, and procedures?

This is clearly not an all-inclusive list, and many of these have important subtopics. So we encourage everyone to submit topics before and during the breakout session. As part of that session, we want to come as close as possible to articulating workable DOTMLPF solutions to the Regiment's leadership for immediate implementation.

The importance of this effort is readily apparent, and it is too easy to say that some of our problems are simply unsolvable. With sourcing for Operation Iraqi Freedom Phase III and beyond already underway, we owe it to the Regiment's great soldiers and leaders who are about to go in harm's way to give them our best effort in determining and solving the challenges they will encounter.



Lieutenant Colonel Koenig is chief of the Doctrine Development Division at the U.S. Army Engineer School, Fort Leonard Wood, Missouri.

How Transformation and JCIDs Impact Construction Equipment Modernization

By Mr. John Hegle and Mrs. Cathy Pryor



Your unit has old, maintenance-intensive construction equipment in need of replacement. While you appreciate the newer systems you've received, such as the hydraulic excavator or vibratory roller, equipment such as loaders and water distributors is in such bad shape you wonder if anyone cares about the unit's ability to accomplish its missions. Some of the equipment just went through a service life extension program, but much of it isn't suitable or cost-effective to rebuild. You may be short of equipment because it was so worn that it was "coded out." It may be difficult to find repair parts for some of the other equipment, or else the parts are very expensive. The unit may even have had to rent or lease equipment, and spent so much it would have been better off buying the equipment—but was told it couldn't. Surely this isn't the way things are supposed to work. Is anyone at the U.S. Army Engineer School planning to help? What is going on?

Change is going on, and sometimes change is painful. Army transformation, the Joint Capabilities Integration and Development System (JCIDS), and the Total Army Analysis process are producing many changes, challenges, and opportunities for the Engineer Regiment. Trying to be responsive to the field in the near term while preparing for the future is a significant challenge. Current world events don't make things easier. Couple that with an acquisition process that has changed almost constantly over the last four years, becoming more complex and time-consuming in an

environment where everything is a possible bill payer, and you have the perfect setting for frustration.

Although the construction equipment budget has been slashed, work continues to define and document the requirements that will enable programming of funds. To understand the situation, you must know the lay of the land. To help yourselves, you must help us sell the critical role that construction equipment is playing in Operation Iraqi Freedom and Operation Enduring Freedom and that it will play in the Future Force. If the Engineer Regiment can't make this case, our chances of getting funding are slender, and our relevance to future operations will decline.

Situational Awareness

To be successful in the future, we must understand the environment we are operating in. At one end of the spectrum, we have the true, on-the-ground field environment—the soldier who can't understand why the Army does not replace his 25-year-old 5-yard loader and who pressed new Taliban loaders into service in Afghanistan because they actually worked. The need for reliable, supportable construction equipment is well understood at this level since it affects day-to-day operations. On the other end of the spectrum—where funding decisions are made—construction equipment must compete against a wide array of systems in a time of very limited resources. This is an arena where budget

decisions may be made in minutes, often without an understanding of their impact on programs or the soldier on the ground. Decisions may be biased against buying new equipment because of the belief that "we can rent or lease commercial equipment if we need it." It is this end of the spectrum where we need to inject reality and understanding. While the future is uncertain, there are many things we know will be required of engineers and their equipment in the Future Force. Engineers will still be called upon to maintain the mobility of the force. Forces will rapidly deploy to territories and occupy them, and sustainment operations will be required. Many missions performed today will still be required tomorrow.

Missions

From a mission perspective, the physics of earthmoving are not going to change, and the requirements to build and repair roads and airfields and perform other construction missions are not going away. We must reduce the footprint of the force, minimize sortie requirements, and yet still accomplish our missions. We must identify the right mix of organizations and equipment. How many units and systems need to be transportable by C-130 aircraft? How many can't be because productivity and timely mission accomplishment outweigh initial deployability? We must pursue more reliable, less logistically burdensome systems that are easier to train, operate, and maintain.

Requirements

Missions drive organizations, which drive system requirements. As we modernize, we must take a hard look at where we are going and ensure that equipment evolves with our missions. We do not want to buy new equipment just for the sake of replacing the old. The Future Force will be a joint force. Deployability, speed, and responsiveness are critical to Future Combat System units and their survivability, as these forces move between noncontiguous areas of operation. Ultra-reliability, two-level maintenance, embedded diagnostics, and other factors also must be considered. These design goals are driven by the Army's transformation objectives.

How does this affect construction equipment? Commercial equipment brings reliability and supportability, but it typically must be adapted to meet Army requirements, such as the addition of blackout lights, a NATO slave adapter, tie-downs, or the redesign or removal of the cab to fit under bridges. Some equipment must meet airdrop, helolift, C-130 airlift or self-deployability requirements. This can drive us to develop military-unique equipment, sometimes compromising the benefits of commercial equipment. We seek to minimize these impacts on the force.

The implementation of JCIDS is a new challenge for the acquisition community and for engineers in particular. Gone are the days when engineers, or even the Army, dictated their own requirements. Today, requirements are top-down driven and supported by a joint vision with a joint concept of

operations. Requirements are developed and evaluated from a joint perspective. An Initial Capabilities Document (ICD) replaces the Mission Need Statement (MNS), and the Operational Requirements Document (ORD) is replaced by a Capabilities Development Document (CDD) and/or a Capabilities Production Document (CPD). The JCIDS is oriented toward identifying and filling capability gaps rather than modernizing existing systems, the primary concern with construction equipment today. The bottom line is that we must ensure that our requirements and capability gaps caused by unreliable construction equipment are expressed and validated by the Department of the Army and the Joint Focused Logistics Capability Review Board and are understood to be critical to the Future Force and joint forces commander.

Budget Challenges

We can't program money without an approved requirements document. We can't defend Program Objective Memorandum (POM) funding without a clear link to the needs of the Future Force. We must fight the perception that construction equipment is a low priority and that we can buy, lease, or rent equipment or get a contractor to do the mission at the last minute. While the argument that commercial equipment is readily available is attractive on the surface, the truth is that leasing, renting, and buying nonstandard commercial equipment is much more costly in the long run. Equipment bought by units on an as-needed basis—

- Does not meet all approved user requirements for each specific equipment end item.
- Does not comply with Army regulations for type classification and materiel release.
- Has not been tested or given a safety release.
- Is not logistically supportable by Army maintenance and supply and does not have sustainment training.
- Is not approved for transportability by military conveyance.
- Is not approved by the Surgeon General's Office for health and safety.
- Is the unit commander's responsibility, as far as accident, injury, or fatality to troops is concerned.

Additionally, it is illegal for units to procure centrally funded equipment with their operations and maintenance money. However, leasing and renting remain attractive options and support Future Engineer Force concepts. A construction equipment lease study has been initiated with the approval of the Army Business Initiative Council. The study seeks to determine how a rent/lease/buy/contract acquisition strategy for providing construction capabilities might be executed and will identify the legal, policy, budget, and requirements changes necessary for implementation. The study will include a trial phase with certain types of engineer units.

“We must be creative and open to new engineer organizations and equipment that are more multifunctional, deployable, and tailorable.”

Why conduct a study? What's wrong with buying? In a resource-constrained environment, we must look at new ways to deliver engineer effects on the battlefield. The upside of leasing/renting is that it gets more reliable systems with embedded diagnostic technology into units. Leasing/renting has a place in the Army in certain situations, but it does come at a price. For example, the projected cost of renting a 5-cubic-yard loader or backhoe loader to support Operation Iraqi Freedom is an estimated \$10,000 per month. Longer-term, “always available” equipment leasing is typically not cost-effective either, as the break-even point is about 4 years. Since the Army keeps construction equipment for 20-plus years, leasing over the entire period would cost five times the price of buying new equipment. Could “just-in-time delivery” leasing for training and deployments be made more affordable? The lease study will evaluate the feasibility of leasing, answer the tough questions, identify prohibitive policies and regulations, make recommendations on potential equipment-leasing candidates, and determine the impact and risks associated with dependence on leasing.

On the procurement front, recent severe cuts have left construction equipment modernization at its lowest funding levels in years. Approximately \$150 million per year is required for life cycle replacement of equipment. Current funding levels are less than one-third of what is required. Until decision makers understand the true cost (such as poor operational readiness, last-minute training, potential safety issues, transportability issues, and contractor logistics support costs) of rent/lease/unit-buy alternatives, funding levels are likely to remain low.

The Road Ahead

Where is the engineer force going? A Future Force concept with modular, tailorable organizations is being developed. New analyses and operational requirements documents are being developed. A Future Force centered around the Future Combat System is being planned. Dramatic change is coming, but the engineer role is not clearly defined yet. Currently, there are no engineers in the unit of action (UA), although this may change. The unit of employment (UE) and the engineer forces and equipment within it are still being developed. One thing we know is that much of the same type of equipment being used today will be required tomorrow. The numbers and proper mix of equipment are the big unknowns at this point and make selling the relevancy of construction equipment to the Future Force much more difficult. In the near term, the 3d Infantry Division and 101st Airborne Division are reorganizing, putting more pressure on

the Engineer Regiment to fight for and define the Future Engineer Force as soon as possible.

Conclusion

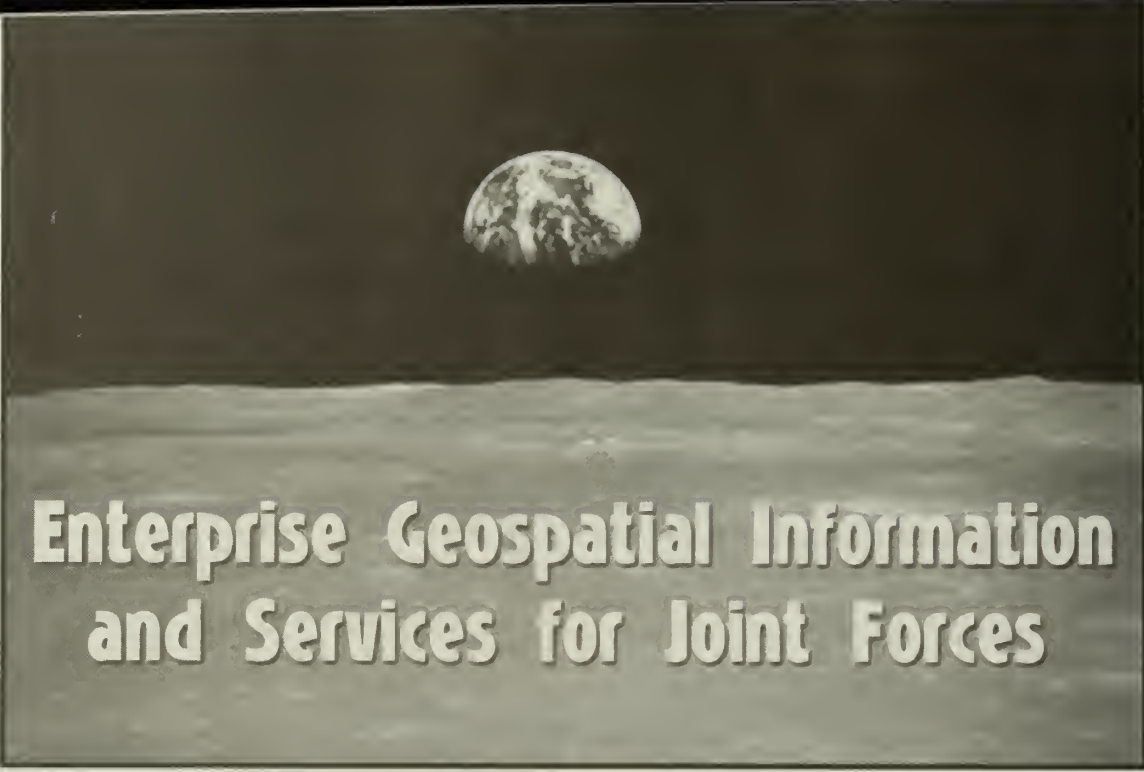
The Engineer Regiment must educate joint and Army leaders on our transformational vision. We must seek better, more innovative ways to get our missions done. As the Army evolves through changing priorities and processes, the impact on engineer functional areas must be assessed to ensure that we can make the case that we are critical to the fight. We must look across the doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) and find new solutions to old mission needs. We must be creative and open to new engineer organizations and equipment that are more multifunctional, deployable, and tailorable. This may require tradeoffs when the benefits of military-specific equipment outweigh the reliability and lower per-unit cost of commercial construction equipment. We must be realistic and not just focus on engineer missions; we must think and plan as joint engineers and focus on being successful. That means assessing risks, strategizing our POM build, seeking joint and other Army proponent support for our capabilities, getting more bang for our buck, and lowering acquisition and sustainment costs. We must think and leverage joint capabilities and embrace a joint expeditionary mindset. We must consider divesting certain missions if it makes sense to do so, while ensuring that our Regiment remains adaptable, flexible, and responsive. We must ensure that the value of construction capability is recognized, especially by the leaders who are making critical funding decisions.

We rely on input from the field to ensure that our requirements reflect reality. If you have ideas to help sell construction capability or the need to replace existing construction equipment—and promote its critical role in the Future Force—please call the Directorate of Combat Developments, Engineer Division, Mobility Team, DSN 676-7338 or 573-596-0131, ext. 37338.



Mr. Hegle is chief of the Mobility Team in the Maneuver Support Center (MANSCEN) Directorate of Combat Developments (DCD), Engineer Division, Fort Leonard Wood, Missouri. He has 17 years of combat developments experience, managing construction equipment requirements development the last 5 years.

Mrs. Pryor is a combat developments materiel analyst, working for the Mobility Team in MANSCEN DCD, Engineer Division. She has worked on requirements development and fielding of construction equipment systems for 11 years.



Enterprise Geospatial Information and Services for Joint Forces

Photo courtesy, U.S. Geological Survey

By Colonel David A. Kingston, Chief Warrant Officer 5 Ken Tatro, and Mr. Ken Bergman

Joint Vision 2020 describes how information will enable dominant battlespace awareness as part of information superiority. Geospatial information and services form the framework for understanding the physical environment and its impact on combat operations. This article shows how joint forces and their service components use geospatial information and services, how information is provided from the national level down to platform/user level, and how that information is dynamically updated and fused at all levels. The article also discusses doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) implications to ensure that the tenets of Joint Vision 2020 are met.

Using Geospatial Information

In the Joint Vision 2020 time frame, joint forces and their components will use geospatial information for three major purposes:

- Battle command.
- Training.
- En route mission planning and rehearsal.

Also, combatant commands (primarily Joint Forces Command) use geospatial information for experimentation and combat development.

The joint command and control (JC2) capability will enable joint force commanders to exercise battle command more effectively. The JC2 Operational Requirements Document (ORD) clearly articulates the need for timely and accurate digital geospatial products. Department of Defense (DOD) battle command capabilities require geospatial data to support all aspects of command and control (C2) and intelligence, surveillance, and reconnaissance (ISR)—from planning and

tasking ISR assets, deliberate C2 planning and dynamic planning/replanning on the move, execution (such as targeting and navigation), and after-action reporting. Also, the distributed common ground station requires geospatial information for analysis and fusion of the weather and the enemy portion of the common operational picture (COP).

The DOD Training Transformation Strategy revolutionizes the way joint and service component forces train. Systems will have an embedded training capability to allow users to train while en route, in-theater, and at home stations. Geospatial information is a requirement for this embedded training. Unforeseen contingencies can require rapidly generated geospatial data before deployment. Also, the Joint National Training Capability that links the major training centers and systems of each service, under development by Joint Forces Command, will not work without the required common geospatial data.

En route mission planning and rehearsal systems are simulations that warfighters will use to rehearse missions before execution. These systems require robust, accurate, and timely geospatial information.

While joint force headquarters and their components need timely and accurate geospatial data, the types of data required will vary. At the joint force headquarters level, an operational level of geospatial data is required. However, the commander and his staff must be able to “drill down” to use high-resolution geospatial information over areas of key interest and importance.

For the naval warfare component (Navy and Marine Corps), the primary focus of geospatial information is on littoral areas, bathymetry (water depths), and navigation charts. The air component is interested in aeronautical charts and vertical obstructions. The land component (Army and Marine Corps)

have the most challenging demands for geospatial information. Because the terrain has such a major impact on land combat operations, ground warfighters need much more detailed geospatial information. As potential adversaries increasingly use complex terrain and urban areas, there will be a commensurate increase in the need for detailed geospatial information. Special Operations Forces—because of their ability to operate on land, sea, and air—require the same type of data but with ultrahigh resolution and extremely timely delivery. Also, joint and service components require geospatial data for targeting. As weapons systems become more accurate, the required accuracy of geospatial data for targeting also increases.

Evolving joint operations rely on service interdependence more than ever, so the lines separating the types of data each service requires are becoming blurred. The bottom line is that battlespace awareness and our ability to conduct joint operations as envisioned in Joint Vision 2020 simply cannot be accomplished without robust, accurate, and timely digital geospatial information.

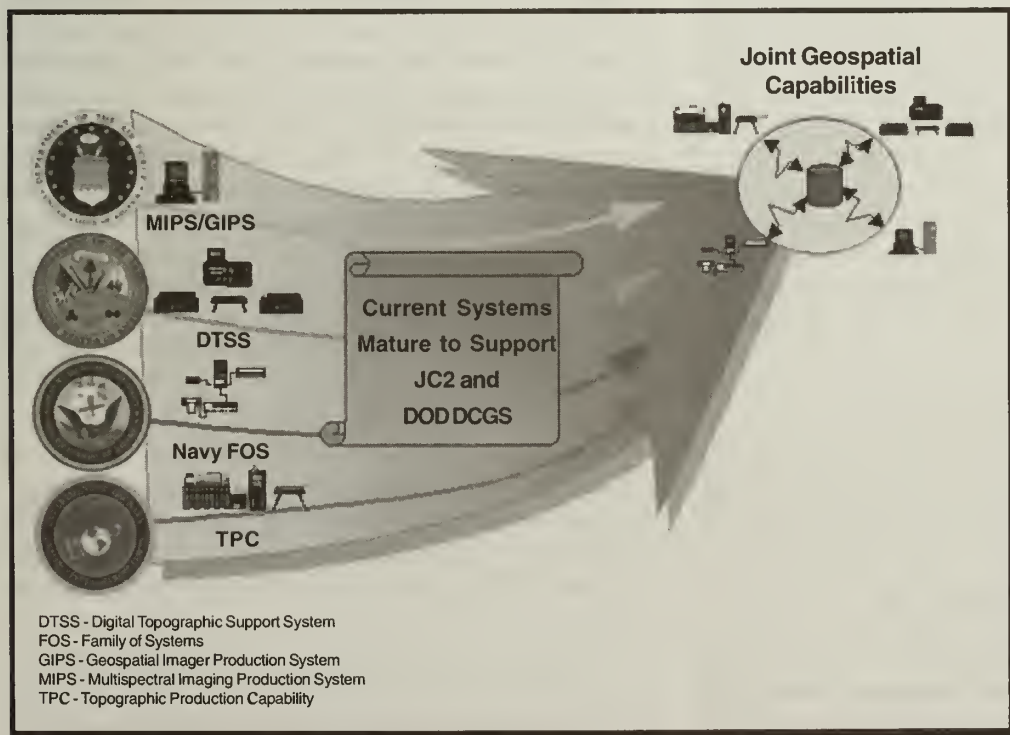
Providing Geospatial Information to the User

The imagery and geospatial Capstone Requirements Document (CRD) and the National System for Geospatial Intelligence ORD describe the concept and process for tasking, collecting, processing, managing, disseminating, and exploiting geospatial information to form the foundation for the COP. In the Joint Vision 2020 time period, the process will begin with a near-global foundation data set produced by the National Geospatial-Intelligence Agency (NGA). For mission planning and visualization,

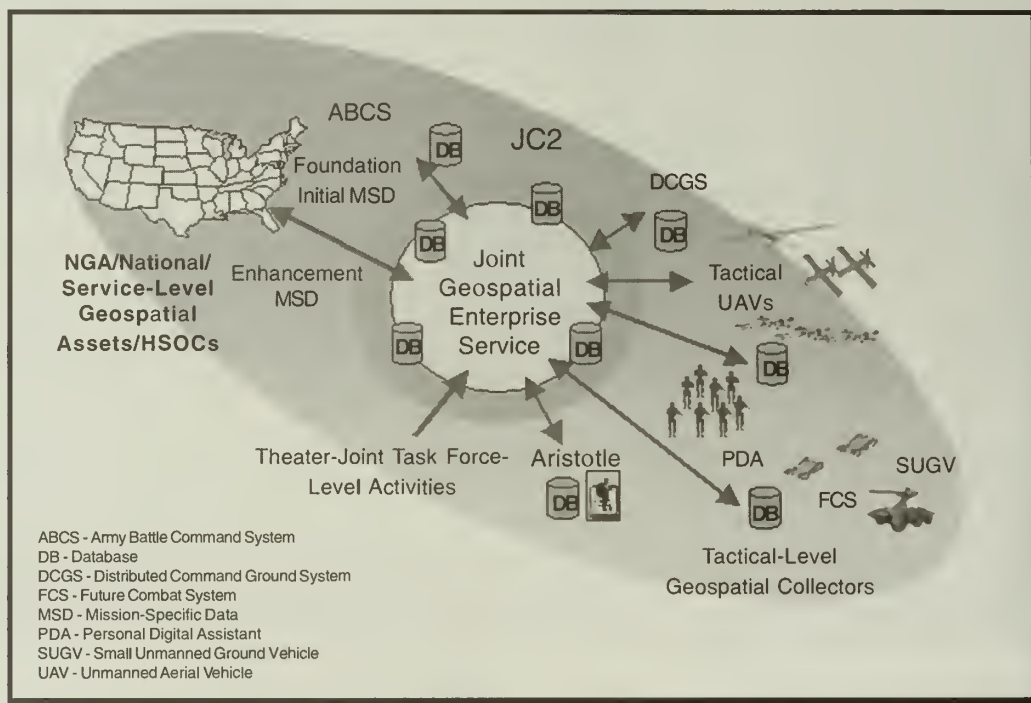
mission-specific data sets will be developed to provide the required level of geospatial information to the combatant commander. Additionally, NGA and the services agreed on a line of demarcation that calls for NGA to provide systems (hardware, software, and exploitation tools) and information down to combatant command level (on a case-by-case basis to the joint task force level). Beyond this line, services will provide their own systems to support their own organizations.

These service systems must comply with the requirements established in the imagery and geospatial support CRD. Thus, at component commander level and below, each service must be able to generate and manage its own geospatial information. For example, the Army must be able to rapidly generate and fuse data from multiple sensors on unmanned aerial vehicles, land vehicles, and individual soldiers.

Services will need to build some terrain data, using an enterprise (distributed) geospatial support capability over multiple sites. This will be achieved using geospatial sensor systems in the field, regional home station operations centers (HSOCs), and service-specific knowledge centers that can augment and build on the NGA foundation data to meet tactical-level needs. Geospatial data files can often be extremely large, and the processes to generate, disseminate, and update this geospatial data depend on a robust management and dissemination/communications architecture. It is envisioned that hard media such as digital video discs (DVDs) and compact discs-read only memory (CD-ROMs) will be used with high-bandwidth communications (where available) to provide the initial load of geospatial data, with radio/satellite communications to transmit updated data to platform and soldier levels.



Joint geospatial capabilities reside on the current service-based systems, and those systems mature to support joint and service-level command and control systems in a network-centric environment.



The Joint Forces Command is sponsoring a Joint Geospatial Enterprise Service to establish the standards and formats necessary for services to interoperate. This capability will evolve from current systems (DTSS, MIPS/GIPS, and TPC).

Manipulating and Fusing Geospatial Information

As missions unfold and more data becomes available, and as geospatial information changes (bridges are destroyed, buildings become rubble), databases must be automatically updated. Updates can come from all sources—from national assets to individual soldiers on the ground. Thus, each service must conduct some level of geospatial data enhancement. Data updates from services will be shared horizontally and vertically up echelons through component headquarters, to combatant commander headquarters, and up to NGA. Only updates to data sets will be distributed, to prevent resending extremely large data files. Management of these data files will be a complex operation. Failure to properly manage, conflate, and distribute data files would result in multiple differing COPs, within and between service components and joint headquarters, with potentially disastrous results.

DOTMLPF Implications

The entire DOTMLPF process must be reviewed to correct the system's deficiencies. The most glaring deficiencies appear to be in the areas of doctrine, organizational designs, and materiel solutions. Joint Publication 2-03, *Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations*—the overarching publication that covers geospatial capabilities—does not adequately address how component and joint headquarters work together to generate and manage geospatial data. Current organizational designs

do not reflect how NGA support teams augment joint task force and service headquarters. Finally, there is no joint geospatial system that provides the necessary capabilities for the joint force headquarters to generate, conflate, and manage geospatial data.

Joint and component commanders require robust, accurate, and timely geospatial information for combat operations. The demand for more exact, accurate, and timely delivery of geospatial information will increase greatly as joint forces and components field increasingly capable battle command training and en route mission planning and rehearsal systems. Our current processes and systems have severe deficiencies that must be corrected if Joint Vision 2020 is to be realized.

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JOINT/ARMY GEOSPATIAL DATA ENHANCEMENT

By Mr. Ken Bergman

This article presents an overview of the essential types of terrain data, their uses and methods of collection, and the use of joint capabilities to overcome terrain data shortfalls. Examples of Army geospatial data enhancement are provided to show how service-level terrain data production can contribute to the warfighter.

The Army requires digital terrain (geospatial) data to function effectively on the battlefield. Today's forces use geospatial data in computer systems to provide an understanding of the terrain in the field. The geospatial data we have does not provide a perfect picture of the terrain, but it should give us a representation that is useful at the appropriate level of detail. Lower-resolution terrain data enables leaders at the theater level to plan operations, while higher-resolution products facilitate tactical-level operations. It is impossible to have digital terrain data that matches the terrain exactly, due to cost and technical limitations. Because our forces deploy worldwide on short notice, there will never be enough terrain data to meet all our needs. It is therefore important that we define our terrain data requirements carefully and focus limited geospatial production assets on the areas that are of most importance to us.

Command and Control Systems and Terrain Data

First, we need to address terrain data applications to establish the relevance of this product to the warfighter. The Army Battle Command System (ABCS) was developed as a cutting-edge suite of tools to deliver command and control (C2) functions across the various battlefield functional areas (BFAs). Significant resources were invested in the ABCS, with the result that the 4th Infantry Division and a few other units were given a high level of capability, while most units did not receive the ABCS. When the U.S. Army's

V Corps deployed to Iraq last year, it did not have the ABCS, so it used a joint system called Command and Control Personal Computer (C2PC), which has less capability than the ABCS but is more affordable. As a result of lessons learned from Operation Iraqi Freedom, a "good enough" initiative was started to define C2 systems that all Army units could field right now, within limited budgets. In addition to C2PC, V Corps also used a system called FalconView™, which provides two-dimensional (2-D) and three-dimensional (3-D) terrain visualization capabilities. Also, Force XXI Battle Command Brigade and Below (FBCB2), which provided an unprecedented blue force tracking capability, used an optimized terrain data load. All C2 systems require some level of digital terrain data to achieve terrain understanding. In addition to C2 systems, the Future Force is scheduled to use terrain data in modeling and simulation formats to conduct training before forces deploy to combat.

In Iraq and Afghanistan, Army and Marine Corps terrain teams supported their respective components at the operational and tactical levels. The National Geospatial-Intelligence Agency (NGA) provided terrain data and theater-level geospatial analysts who supported Army terrain teams at the operational level. Army and Marine Corps terrain teams supported their respective components at the operational and tactical levels. Coalition forces made important terrain data contributions, especially in the early fighting in Afghanistan. But where does terrain data come from, and how can we ensure its availability?

Terrain Data Types

Some essential types of terrain data that the Army requires are maps, imagery, elevation data, and feature data. The NGA is the primary source for these products.

Maps. Maps are still a geospatial mainstay for the soldier. It is important to have both hard-copy and digital versions. The digital versions in the field need to be the same as the hard-copy maps.

Imagery. Georeferenced imagery provides a digital "photo" of the terrain with embedded geocoordinates (latitude/longitude or the Military Grid Reference System). The NGA is rapidly building an archive of unclassified georeferenced imagery which can help achieve terrain understanding.

Elevation Data. This data provides a digital representation of the earth's surface. At lower resolutions, this product provides a basic understanding of the lay of the land. At higher resolutions, elevation data provides a detailed representation of roads, alleys, and multilevel buildings in urban environments. Higher-resolution elevation data can give soldiers an important advantage in both urban and complex terrain. Elevation data is a key element for terrain reasoning, because it can be used to derive slope and other aspects of the "skin of the earth" that impact maneuverability.

Feature Data. Terrain features (such as roads, bridges, rivers, utilities, and buildings) are represented by digital feature data. Attribution ("right-click" data) is an important aspect of feature data, since it defines an object to some level of detail (such as bridge specifications, number of lanes in a road, stream velocity, and bank height). Figure 1 shows an example of feature data. The right-click information for one of the hard-surface roads is shown here in the feature table. Feature data with sufficient levels of detail can be used in automated systems to predict mobility, counter-mobility, and other terrain analysis parameters.

Terrain Data Generation and Use

Figure 2 shows a top-level overview of terrain data generation, transformation, dissemination, and use. Source data is collected using satellites or in-theater assets. This data is processed to generate interim products, which are transformed into finished products for use by field units. In some cases, source data and interim products can be used effectively by warfighters, before transformation into finished products.

Terrain Reasoning

Current battle command systems can display a static snapshot of a particular aspect of terrain (such as mobility analysis or helicopter landing zones). Terrain reasoning, on the other hand, gives the maneuver commander the power to do "what if" terrain analysis based on changes in the terrain using the C2 system in real time. For example, if a soldier encounters a minefield or a destroyed bridge, he can enter an icon to indicate that the road is blocked and then conduct a new route analysis based on criteria such as the fastest route, shortest route, and covered and concealed routes. This technology is being developed by the U.S. Army Engineer Research and Development Center-Topographic Engineering Center (ERDC-TEC). Terrain reasoning has not yet been fully embedded in C2 systems, but TEC is working with the Communications and Electronics Research, Development, and Engineering Center (CERDEC) to achieve this. Terrain reasoning requires the use of elevation data and feature data with sufficient right-click content to enable automated analysis. Without good data, the results of both static analysis tools and terrain reasoning applications will not adequately support tactical-level warfighters.

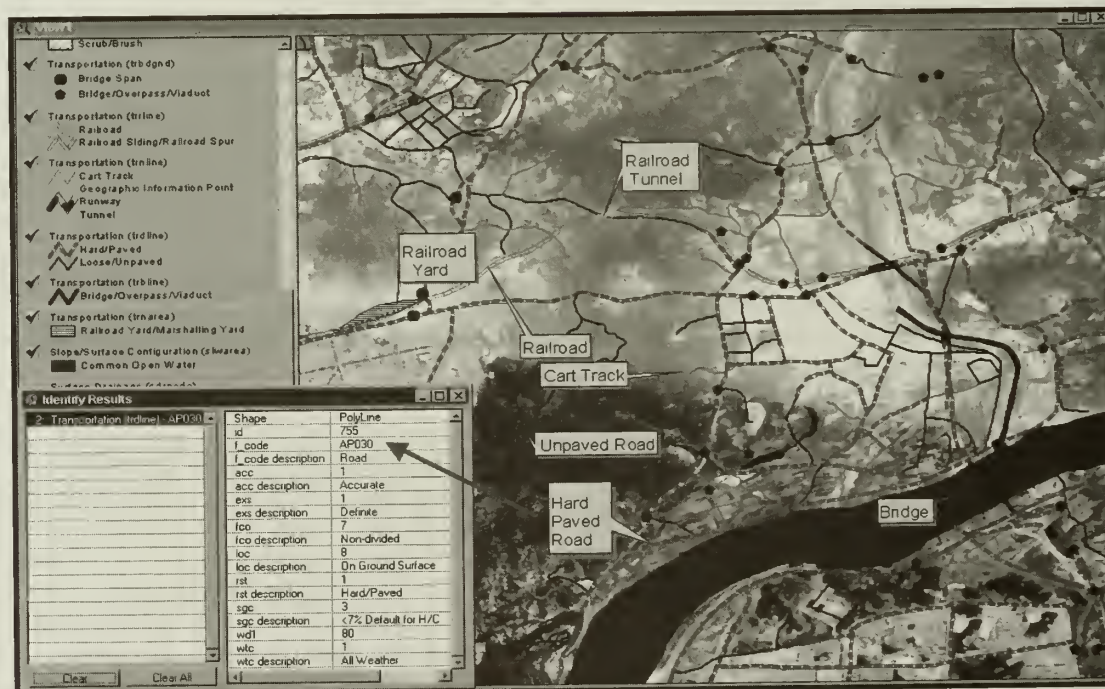


Figure 1. Feature Data - Transportation Layer

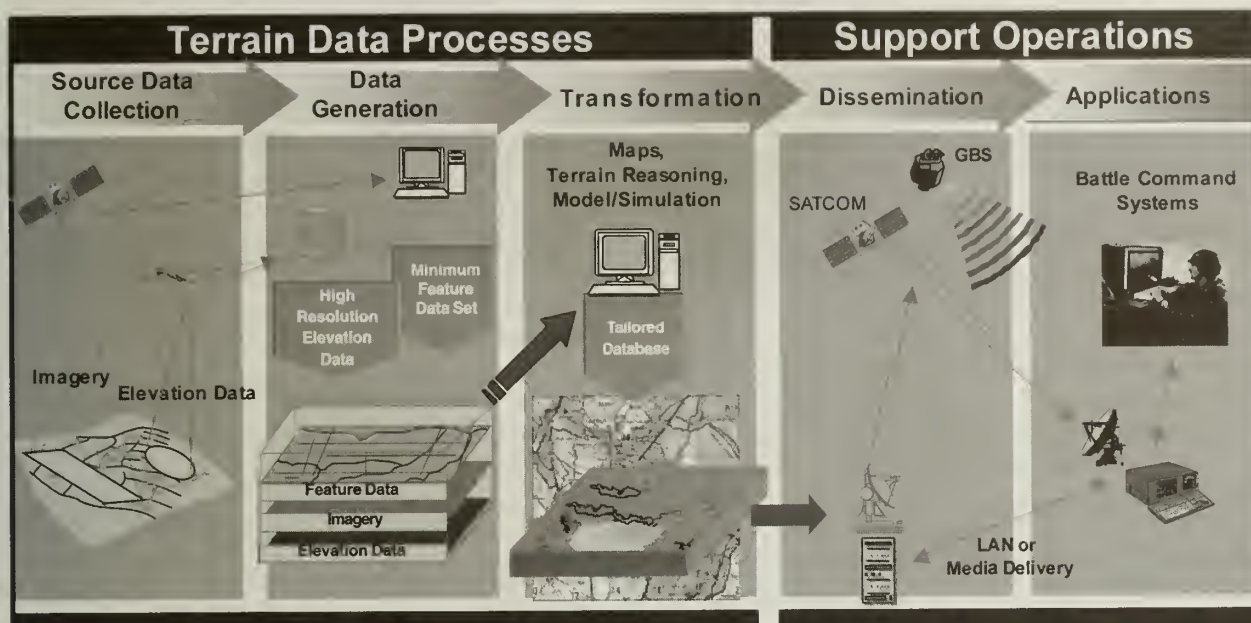


Figure 2. Geospatial End-to-End Process

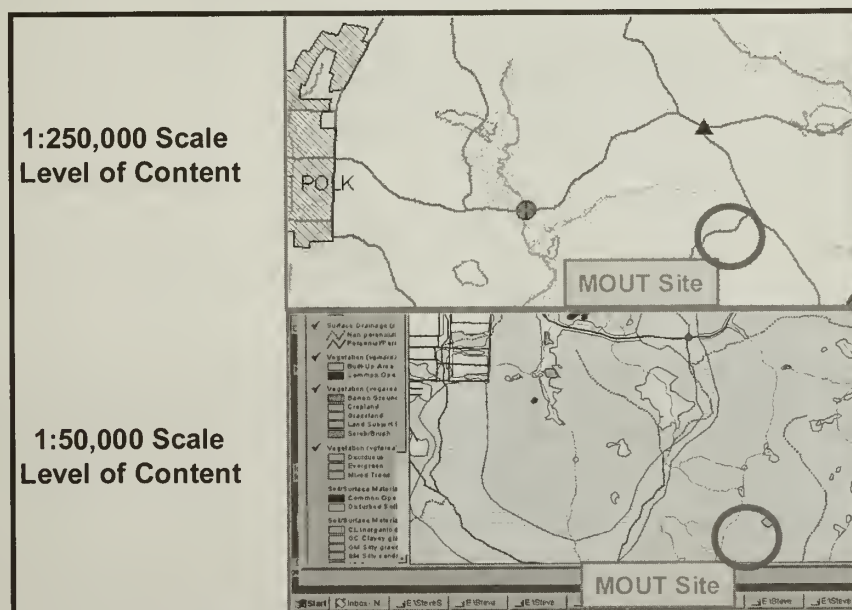


Figure 3. Varying Levels of Content in Feature Data

Terrain Data Shortfalls

There is a huge shortfall in terrain data worldwide. There are not enough current, detailed maps to support rapid response to contingencies in many regions. The digital geospatial picture we provide to soldiers plays a key part in all four steps of the Army's credo of "see first, understand first, act first, and finish decisively." We must do better. We must provide a better geospatial representation of the battlespace to give our soldiers the home field advantage before and during crisis response.

Figure 3 provides an example of the terrain data shortfall. The feature data displayed here shows North Fort Polk, Louisiana. The upper depiction shows feature data at a

1:250,000 scale, while the lower depiction shows a tactical level of detail (1:50,000 scale). The 1:250,000 version missed many features that impact maneuver, such as dirt roads, open spaces, an airport, the detailed road network in the city, more detailed stream network, and the military operations in urban terrain (MOUT) site. Clearly, a battalion commander planning maneuvers in this region would need the 1:50,000 level of detail. In terms of terrain reasoning, a computer algorithm would provide much different results based on the level of detail provided at the 1:250,000 scale versus the 1:50,000 scale. Much of the world has 1:250,000 scale feature data available, but there are relatively few places where feature data is available at the 1:50,000 or 1:100,000 scale. In addition, the right-click data for these features is frequently inadequate.

Overcoming the Shortfall

The Army and NGA are working with the joint community to overcome the terrain data shortfall. The NGA has the mission and resources to build most of our geospatial products. There has been a marked increase in the generation of source products, including imagery, elevation data, and feature data. Although NGA has built more source products, there is a growing shortfall of finished geospatial products such as maps and terrain reasoning data. There are three steps to overcoming this shortfall.

NGA Oversight. The process of prioritization for NGA production has resulted in an increased availability of source products, but not enough finished products. Users must shift NGA's focus toward the generation of more finished products.

Increased NGA Funding. There is a shortfall in NGA resources for geospatial data production. Once the priorities for producing finished products are addressed, the NGA should get more resources for increased production of finished products.

Service-Level Geospatial Data Enhancement. The NGA will remain the "factory" for the majority of geospatial information, but the services have a role to play in terrain data generation. Before deployment, home station operations centers (HSOC) will provide custom products using available geospatial assets. At some point, as forces flow into theater, warfighters on the ground will be the true experts regarding knowledge of the terrain. New sensors—such as handheld personal digital computers—will provide a surge of information that will be captured at the service component level in theater, with data flows to the national level for archiving at NGA.

Geospatial Data Enhancement

The services will not build maps en masse for the NGA, since it is NGA's mission to build maps and other standard products. So if NGA is the factory for production of terrain data, what will the services do to contribute? Below are three examples of geospatial data enhancement that are taking place now, and that will increase in the future.

Urban Tactical Planner (UTP). The UTP is a digital product that provides detailed urban terrain information to users. TEC has built and distributed many UTPs over high-interest urban areas. UTPs can be used from remote sites via the Web or can be installed for use on individual workstations without the purchase of software licenses.

Analysis Feature Data. The Maneuver Support Battle Lab, Fort Leonard Wood, Missouri, in conjunction with other Training and Doctrine Command (TRADOC) organizations, is conducting experiments using NGA feature data that has good spatial accuracy, but limited attribution (right-click information). ERDC-TEC is building more attribution into this feature data and merging new features into the data set to facilitate the use of new terrain-reasoning capabilities in experimentation. ERDC-TEC will also examine the types of features and attributes

needed for terrain reasoning, in conjunction with the U.S. Army Engineer School's Terrain Visualization Center, now located at the Technology Park at Fort Leonard Wood, Missouri.

Modeling and Simulation (M&S) Terrain Data. The Army has developed its own capabilities and infrastructure to convert NGA data into M&S formats. The Future Force will use M&S training capabilities in wargame scenarios before deployment, making Army forces more effective. The shortfall in detailed, high-quality terrain data directly impacts M&S applications, just as it limits C2 applications.

Relevance to the Warfighter

The availability of terrain data was a critical aspect in joint operations in Afghanistan and Iraq. Army terrain teams, working with joint and coalition forces, defined helicopter landing zones, avenues of approach, and trafficability analyses using geospatial data. After major combat operations ceased and nation building started, geospatial products were used for follow-on stability operations and support operations (SOSO). Mapping urban regions in more detail is very important, with route analysis and emerging urban terrain products becoming more relevant as lessons learned are incorporated into newer geospatial tools.

Implementation Plans

Past, current, and future operations can become more successful through the availability of high-quality geospatial products. There is clearly a need for joint geospatial data enhancement to build on NGA's terrain data. The Army is working at the joint level to increase the production of terrain data. At the service level, the Army is formulating plans to build more infrastructure for geospatial data enhancement, to include ERDC-TEC as the Army-level geospatial knowledge center; theater-level geospatial centers of excellence; and geospatial sensors and support capabilities at the unit level. The Army is considering how to implement a test bed to examine geospatial data enhancement processes. Joint Forces Command and the other services are initiating a Joint Geospatial Enterprise capability that uses distributed assets to meet the user's needs, not just at a single, centralized location. Trade studies are being defined by the NGA and the Army to determine the best mix of assets to meet geospatial shortfalls. All of these efforts will provide better geospatial support for the warfighter. In the meantime, the Army will use all in-house resources to provide the field with the best possible geospatial support and simultaneously push to get more finished products from the NGA.

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Mine and Explosive Ordnance Information Coordination Center Operations in Iraq

By Major William B. Blaylock II and Mr. Dorian V. D'Aria

Since Desert Storm in 1991, U.S. forces have operated in numerous foreign areas—to include Kuwait, Somalia, Bosnia, Kosovo, Afghanistan, and Iraq—littered with land mines and the explosive devices of war. Each of these countries presented a unique set of explosive hazards, enemy activities, environmental conditions, and operational requirements for our soldiers. In each case, U.S. forces participated as part of the joint and multinational coalition community, often including military and nongovernmental organizations.

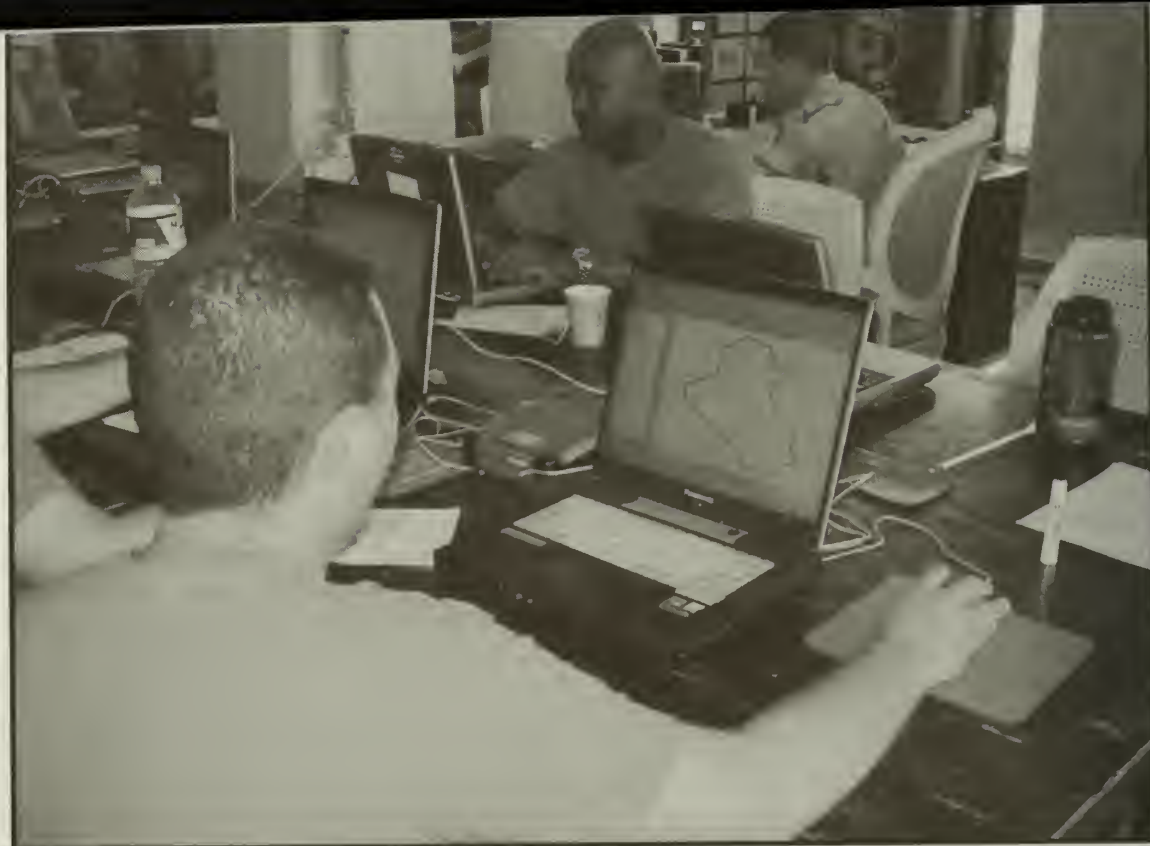
Historically, each area of operations might have had an ad hoc Mine Information Coordination Cell (MICC) to track explosive hazards, coordinate safe military movement in mined areas, support force protection through hazard awareness training, and occasionally provide oversight of indigenous demining activities. If humanitarian demining operations were active in the region, the United Nations often established a National Mine Action Authority (NMAA) to coordinate Mine Action Center (MAC) operations in theater.

Unfortunately, the U.S. Army does not have procedures or a doctrinal organization to conduct MICC operations, which often results in regional improvisation and diversity among units. Minefields and hazards might be tracked with Excel® spreadsheets, FoxBASE®, Access database, or Microsoft® PowerPoint® slides and a grease pencil. Often, relations between military MICCs and humanitarian demining activities were hostile, or at least strained. Coordination between coalition partners and U.S. ground forces had no common baseline for information dissemination and cooperation.

Anticipating these problems, U.S. Central Command (CENTCOM) Coalition Forces Land Component Command (CFLCC) staff engineer section (C7) contacted the U.S. Army Engineer School Countermine/Counter Booby Trap Center (CMCBTC) at Fort Leonard Wood, Missouri, for help in designing a theater MICC for Iraq and developing a training plan for its implementation. The C7 recognized that an active, functional MICC was needed to support military operations in Iraq, stabilize the nation, and reconstruct the country. It would



Soldiers of the 203d Engineer Battalion train to find mines as part of the extraction drill process. This helps soldiers safely extract themselves if they inadvertently enter a minefield.



Tactical Minefield Database System

require coordination with all ground forces and joint U.S. and coalition militaries, as well as humanitarian agencies, the United Nations, and numerous nongovernmental organizations.

Eventually, the Iraqi theater MICC was named the Mine and Explosive Ordnance Information Coordination Center (MEOICC) and its mission assigned to the 1138th Engineer Battalion (Missouri Army National Guard) on 31 March 2003. Since the MEOICC was a new concept, and the 1138th was designated as the first prototype, the unit was reorganized to satisfy the requirements of a MEOICC. The 1138th concluded its predeployment training at Fort Leonard Wood with a three-week MEOICC operations course presented by the CMCBTC. Training included tracking mines and explosive hazards with the Tactical Minefield Database (TMFDB) System, MICC operations and procedures, mine awareness instructor training, engineer-specific instructor training, United Nations demining operations and standards, information collection and analysis, incident investigation, an overview of mine detection dogs, and other topics to enable them to conduct their mission. Also, key members of the staff traveled to Bosnia to examine operations in an active MAC/MICC before departing for Iraq.

The 1138th Engineer Battalion deployed into theater on 23 May 2003 and was augmented with a U.S. Marine Corps explosive ordnance disposal (EOD) staff sergeant, a Mongolian captain, a Ukrainian major, and an Australian major to constitute the MEOICC. Throughout Operation Iraqi Freedom, the MEOICC provided a common operational picture (COP) and situational awareness of all known explosive hazards to enhance force protection and the operations of coalition forces. This information was provided to all coalition forces and to NMAA humanitarian operations that involved mines,

unexploded ordnance (UXO), improvised explosive devices (IEDs), and booby traps in order to minimize injuries to friendly forces and civilians. Through the efforts of the 1138th, countless lives have been saved. Units have better awareness of explosive hazards in the area, and through explosive hazard awareness training, soldiers understand how to respond to explosive hazards.

The TMFDB was indispensable for tracking minefields, UXO, and IEDs. The system is based on ArcGIS™ (civilian software) and allows analysis of explosive hazards with greater ability than previous methods. (Historically, MACs had little ability to locate, track, and portray explosive hazards.) The TMFDB team provided geospatial products for the Coalition Joint Task Force-7 (CJTF-7), major subordinate commands, Task Force Restore Iraq Electricity, the captured enemy ammunition cell, the NMAA, and elements of the Coalition Provisional Authority. The TMFDB team posted overlays using Command and Control Personal Computer (C2PC) software, shape files for use in ArcGIS and FalconView™, spreadsheets containing explosive hazard data, and maps showing demining nongovernmental organizations working in theater.

A variety of units used this information. Brigade combat teams accessed information about nongovernmental organizations working in their battlespace. Since this information became available in late July 2003, there have been no incidents of coalition forces mistaking nongovernmental organization personnel for opposition fighters. (There had been one incident before this process was enacted.) The C5 Strategy, Policy, and Plans Section regularly uses TMFDB data to analyze IED attacks in the planning process, and the data was often used to prepare for military operations.

The MEOICC also included an Explosive Hazard Awareness Team (EHAT), which evolved over the deployment. At the outset, the program of instruction focused on mine and UXO awareness, but it soon became obvious that IED awareness training was critical. The officer in charge of the team and his trainers developed IED training to incorporate into the explosive hazard awareness program of instruction. Over seven months, the EHAT trained 4,500 soldiers on explosive hazard awareness and trained 279 soldiers as EHAT instructors for the brigades. These instructors undoubtedly caused a cascade effect in the number of soldiers trained. The Center for Army Lessons Learned has pushed an updated training package produced by the EHAT for use at all continental United States (CONUS) replacement centers. Again, the efforts of the MEOICC have helped to better protect U.S. and coalition forces.

Throughout the deployment, the MEOICC communicated with CJTF-7 entities such as the C3 Center for Army Lessons Learned, the C3 Training Cell, the IED task force, and the Topographic Cell and provided an electronics specialist to support the Combined Explosives Exploitation Cell (CEXC). The MEOICC improved information-sharing among the CEXC; EOD battalions; C2 (Intelligence) Coalition Analysis and Control Element; C5; the Antiterrorism Force Protection Agency, the National Ground Intelligence Center; and the IED task force. The result was a series of tactics, techniques, and procedures posted on the Secret Internet Protocol Router Network (SIPRNET) and Combined Enterprise Regional Information Exchange System (CENTRIXS) Network for subordinate units to improve force protection. Results speak for themselves. Since 1 October 2003, there has been a 5 percent reduction in the number of forces killed and wounded in action from IED attacks. On the other hand, the percentage of IEDs found has increased by 14.6 percent.

From deployment into theater until February 2004, the MEOICC played a pivotal role in the distribution of the Interim Vehicle-Mounted Mine Detection (IVMMD) System and the Buffalo mine-protected clearance vehicle. The operations section orchestrated the movement of these vehicles into theater for IED reduction in support of Task Force Right of Way, which uses the IVMMD, the Buffalo, D-7 dozers, and additional equipment to clear the shoulders and medians of main and alternate supply routes. Task Force Right of Way was first organized and tested in the 4th Infantry Division (4ID) area of operations. From 31 October 2003 to 9 January 2004, the percentage of IEDs found increased from 45.5 percent to 74.6 percent in the 4ID area of operations. Members of the MEOICC have frequently communicated with the Program Manager-Close Combat Systems to discuss additional technologies that could defeat IEDs.

While MICCs have existed in the past, this was the first time that a military unit was formed to support full-scale communication between civilian demining organizations, track explosive hazards in theater, conduct low-level analysis of

data, and provide explosive hazard training. The MEOICC provided two liaison officers to communicate with the NMAA. The MEOICC developed a system to draw captured enemy demolitions for distribution to the nongovernmental organizations. The demolition stockage was critically low until this system was put in place. Now nongovernmental organizations draw captured enemy demolitions from bunkers maintained by NMAA and protected by coalition forces. This has greatly reduced the number of explosive hazards and UXO capable of injuring or killing civilians and coalition forces, while saving coalition explosives resources.

The cooperation and assistance provided by the MEOICC to the NMAA and other civil activities have brought considerable respect and support from numerous humanitarian agencies. These agencies have credited the U.S. Department of Defense and CENTCOM with supporting the reconstruction and humanitarian efforts of the international community.

The 1138th Engineer Battalion also provided critical support to the C7. The logistics section organized hand receipts of all equipment purchased for the C7. The communications section designed the network schemes, installed wiring to support more than 120 C7 computers, ensured that systems functioned, and supported other units during the deployment. The section also established nightly videoteleconferences for the C7, which enhanced the ability of the engineers to stay synchronized across Iraq.

Additionally, the driver team provided security and transportation for the C7. These soldiers conducted convoy briefings, researched appropriate routes, trained personnel on communications requirements, and drove personnel throughout the theater. Without the support of the 1138th Engineer Battalion, the C7 would not have been as productive in its efforts.

In summary, the 1138th Engineer Battalion performed exceptionally well during its deployment and has laid the foundation for future operations and the establishment of MEOICC/MICC doctrine. Its contribution to the fusion of explosive hazard information, production of the COP, and explosive hazard awareness training has saved lives and combatted attacks from roadside bombs. This valuable commodity significantly supported planning for joint and coalition operations, helped bridge the gap between military and civil operations, and ultimately supported national objectives. 

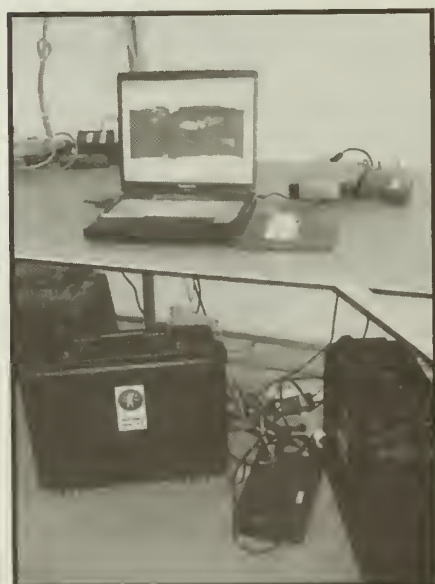
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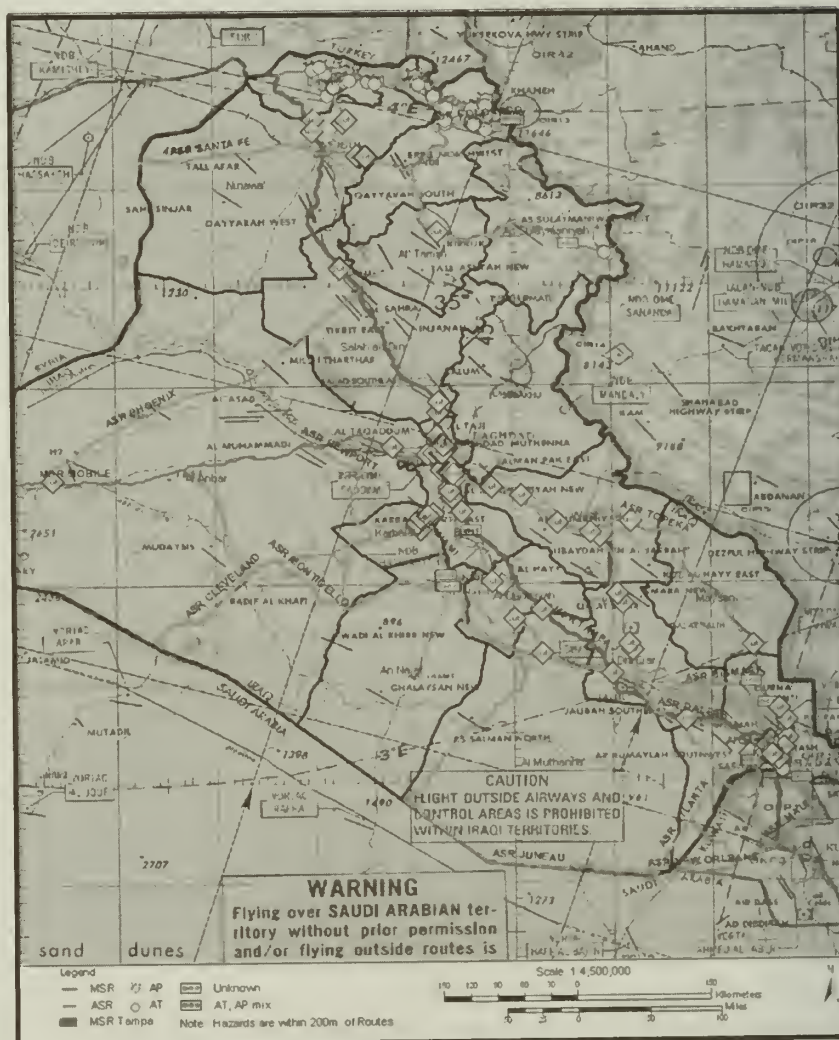
TOOLS OF WAR

By Captain Trey Birdwell and Captain John A. Klemunes, Jr.

Successful future operations depend on lessons learned from previous operations. This implies incremental improvements and review of each process. Tracking explosive hazards during Operation Iraqi Freedom is an example of improving operations by using lessons learned from Operation Desert Storm and the stability missions in Bosnia and Kosovo. Minefields and unexploded ordnance (UXO) are battlefield hazards that remain long after combat operations have ceased. Tracking explosive hazards continuously throughout operations over an area the size of California is extremely important. Equally significant is the establishment of a system to disseminate this information to subordinate commands daily. The system used by the Coalition Forces Land Component Command (CFLCC) engineer staff section (C7) was the Tactical Minefield Database (TMFDB) System prototype, which gave engineers a way to track and disseminate explosive



Tactical Minefield Database System



Hazard Analysis of Main and Alternate Supply Routes

hazards information on the battlefield. Using the TMFDB, the CFLCC tracked the location of all air and ground cluster munitions, as well as new and previously recorded minefields. (Note: The CFLCC emplaced no minefields during Operation Iraqi Freedom.)

Before the TMFDB, Army engineers did not have an efficient, standard, automated method for recording, archiving, and disseminating enemy and

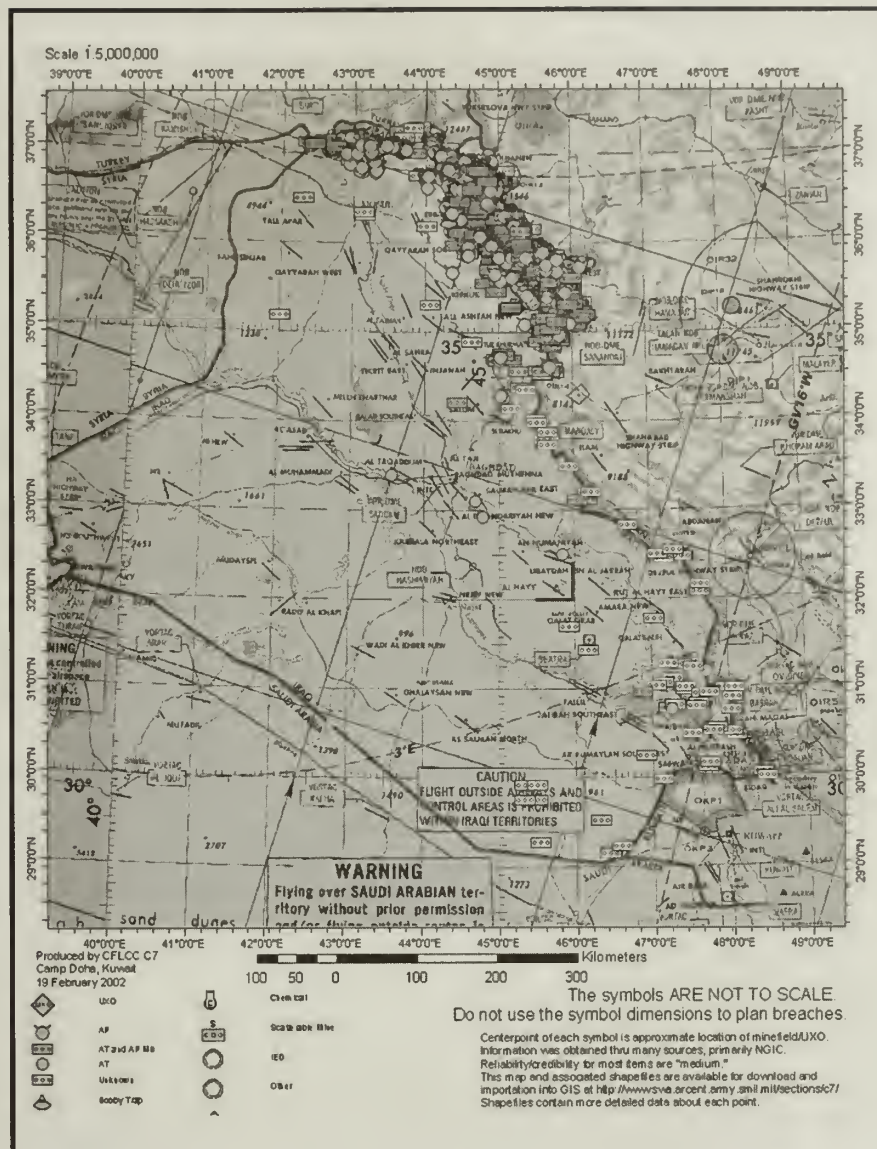
friendly obstacles. During Operation Enduring Freedom in Afghanistan, Army engineers used Microsoft®Excel spreadsheets and grease pencils to track minefields and explosive hazards. This technique has not changed in the past 50 years and is used throughout the engineer community. Although this tracking technique archives valuable mine information, it does nothing more than simply save the information. What

we have not done in the past is make this information available in a common digital format for viewing, nor have we placed it in a database format that is conducive to analysis.

Placing minefield information in a digital format known as the common operational picture (COP) and entering the information in a database for analysis were the objectives of collection during Operation Iraqi Freedom. A system had to be found that could share the information via the COP and put it in a database format. The search started with current systems used by the CFLCC, including the Command and Control Personal Computer (C2PC) and the Force XXI Battlefield Command-Brigade and Below (FBCB2) System. While these systems are appropriate for command and control functions, they cannot process and manipulate obstacle information as part of a functional database to the required level of detail. After studying the systems used by the CFLCC and not finding an appropriate program, the U.S. Army Maneuver Support Center (MANSCEN), Fort Leonard Wood, Missouri, was asked to help in the search.

MANSCEN then asked the project director of Combat Terrain Information Systems (CTIS) to develop and distribute the TMFDB. MANSCEN, CTIS, and TASC (a business unit of Northrop Grumman Information Technology [IT]), have developed a portable system that combines mapping and imagery with a minefield-obstacle database as a subset of the Maneuver Control System-Engineer (MCS-E). During Operation Iraqi Freedom, CFLCC C7 purchased multiple TMFDB Systems and provided additional computers to the Coalition Joint Task Force-7 (CJTF-7) for posthostilities explosive hazards tracking.

The fielding requirement called for the theater engineer cell to employ the TMFDB to develop the hazard database foundation for the Mine and Explosive Ordnance Information Coordination Center (MEOICC) and to provide immediate explosive hazard situational awareness to all forces. The TMFDB



Known or Suspected Minefield Locations

enabled the CFLCC C7 to accomplish this task and distribute hazard information to nongovernmental and humanitarian assistance organizations. Three days after the war began, the CFLCC C7 distributed to these agencies information about all known hazards in the database, including all known minefields and mine strike information, dual-purpose improved conventional munitions (DPICMs), and cluster bomb unit (CBU) munitions.

All the available data was placed in the database to establish a baseline, and daily data collection commenced. The CFLCC fire support element provided the impact grids and times for Army Tactical

Missile System missions. Then the CFLCC had to locate munitions dropped by fixed-wing aircraft. This was slightly more difficult since there were several entities dropping cluster munitions during the air campaign. The separate air components provided mission reports for immediate tracking and future analysis. We received daily reports of all cluster munitions employed in theater. More than 5,000 explosive hazard areas, including cluster munitions and conventional minefields, had been reported by the end of the ground campaign.

Explosive hazards entered in the database exceeded 300 a day during combat operations. The sheer volume of

information was staggering and quickly grew beyond the capability of one data entry person, so our coalition partners provided two soldiers to help. In addition, we received two American terrain analysts who analyzed explosive hazards and their impact on mobility. Without their expertise on the ArcMap® software, we would have been unable to supply many of the requested specialty products to the command. These included distribution of explosive hazards in each Iraqi province and analysis of explosive hazards on main and alternate supply routes. This database would not have been possible without the efforts of those soldiers.

Since the TMFDB was so new and had limited distribution, the CFLCC was forced to enter the data and top-feed information. The CFLCC received information from subordinate commands, entered it into the TMFDB, then sent updated reports to subordinate commands. While this system worked, it was not the preferred approach. All information should have been entered at division level or below and then forwarded to the CFLCC for compilation and dissemination. The CJTF-7 C7 is distributing TMFDB computers down to division level so a bottom-fed reporting system can be implemented, increasing the accuracy and timeliness of reporting.

The TMFDB is only beneficial if units in the field can use the data. TMFDB information, including shape files for topographers to create maps and hazard overlays for the C2PC, is distributed primarily through classified networks. The information is also posted on secure Web sites. In addition, an Excel spreadsheet is posted with all hazard information. One example of a major subordinate command using this information during operations was when the C2PC hazard overlay was used as part of the mission analysis for installing an Inland Petroleum Distribution System (IPDS) (see *Engineer*, July-September 2003, page 13.) A minefield was identified in the proposed location of the pipeline, so the location was changed before construction to reduce the risk posed to soldiers and to avoid a probable delay in construction. A second example of the

practical use of TMFDB hazard information was the creation of maps showing hazard areas within 200 meters of all Iraqi pipelines and oil fields. These maps showed oil field repair teams where all the known explosive hazards were located in their area of operations so they could safely identify routes while assessing and repairing oil infrastructure.

As with any database, the output available is only as good as the input received. Engineer units must stress improved recording and reporting of explosive hazards. Accurate and timely data was very difficult to gather and assess during the campaign. An established reporting system would make the TMFDB a bottom-fed process, as desired. For this system to succeed and mature, a peacetime training plan must be implemented at the combat training centers to track dirty battlefields before, during, and after battles. This will exercise the users' understanding of the TMFDB and help report and track explosive hazards present on the battlefield. This effort will reinforce reporting chains and increase situational awareness of explosive hazards on the battlefield.

The TMFDB is a software program that uses a Geographic Information System (GIS) platform. The use of Environmental Systems Research Institute ArcGIS™ software is beneficial since it has been extensively integrated into the military topographic community. Using an existing commercial format and modifying it to meet current needs significantly decreased the fielding time to receive the system and put it into operation. In addition to its powerful computing capabilities, the system is very durable. Hardened computers are loaded with the software (TMFDB, ArcGIS, ArcMap®, ArcToolbox®, ArcCatalog®, FalconView™, MCS-E, Military Analyst, Windows® 2000 Professional, Microsoft® Office) necessary to perform the explosive hazard tracking mission. They also come with an external 200-gigabyte hard drive, loaded with maps and imagery for the entire area of responsibility. Additional hardware includes an uninterruptible

power supply and two hard-shell Pelican transport cases.

The prototype TMFDB is the first release in a spiral development of MCS-E. Upon delivery, the database would not merge with other databases, nor would it export to C2PC. Northrop Grumman IT TASC programmers quickly fixed those problems, and the U.S. Army Countermine/Counter Booby Trap Center (CMCBTC) and the Topographic Engineering Center provided upgrades through telephone calls and e-mail messages. These two offices redirected funding and prioritized efforts when needed. Through their hard work, the database became fully functional with additional upgrades that increased the tracking capability of the software.

Although the TMFDB System was in the developmental stages when it was fielded, its capability to process and distribute hazard data proved to be a useful force multiplier. We expect future releases to continue to enhance the capabilities of this system. It was introduced in time to significantly enhance the survivability of our combatants during one of the most violent ground attacks in the history of modern warfare. Fortunately, forward thinkers saw to it that fielding, training, and integration occurred before this campaign commenced. We can attribute better battlespace management to the efforts of the individuals who made this possible.



Captain Birdwell was the CJTF-7 current operations engineer battle captain when this article was written. He is now in the Engineer Captain's Career Course.

Captain Klemunes is a reservist who is now on active duty. He holds a master's in civil engineering and is a licensed professional engineer in California, Virginia, Maryland, and Pennsylvania.

For further information, contact the U.S. Army Countermine/Counter Booby Trap Center, Fort Leonard Wood, Missouri, at (573) 596-0131, ext. 37224, or DSN 676-7224.

Quality Assurance Feedback Program



Much like the pace at which we entered Baghdad during Operation Iraqi Freedom, the pace at which we transform the training of our soldiers to meet the Army's needs in the contemporary operational environment (COE) must be swift and deliberate.

As our nation continues the Global War on Terrorism, we must train the "critical" tasks required for success on the battlefield. Since the conditions will vary with each operation, our soldiers must receive training on a wide variety of tasks to function in the COE and accomplish the mission. Existing tasks may need to be revised, new tasks may need to be developed, and doctrinal changes may be warranted. Your feedback, as a member of the Engineer Regiment, is needed.

To obtain ideas, concerns, and comments, the U.S. Army Engineer School has established the Quality Assurance Feedback Program to solicit feedback from graduates and their supervisors. The program will help ensure that the tasks trained in the school are current and that soldiers feel confident they can perform the tasks upon graduation. We need frank and honest feedback to determine if modifications to the training base are needed.

To address these concerns, the following e-mail address has been established: [<atzqtqaoen@wood.army.mil>](mailto:atzqtqaoen@wood.army.mil). There are two ways that soldiers can assist the Engineer Regiment: First, they can use this address at any time to submit concerns and provide feedback on training. Second, upon graduation from a resident course, they will be given a letter to present to their supervisor. This letter will request that each supervisor send an e-mail to the above address and provide the soldier's name, course name and class number, and graduation date. Six to twelve months following graduation, soldiers will be sent surveys to address concerns and/or to comment on the training provided at the Engineer School. The graduate's supervisor will also receive notification to respond to a survey requesting feedback on the soldier's performance following training. Recommendations to change course curricula will then be forwarded to the commandant of the Engineer School.

Additionally, as veterans return from the Balkans, Operation Enduring Freedom, and Operation Iraqi Freedom, we will seek to collect their feedback as well. All comments and concerns should be sent to the Quality Assurance Office/Quality Assurance Element at the e-mail address shown above.

1437th MRBC Bridging In Iraq

By Sergeant First Class Robert Milligan

The 1437th Multirole Bridge Company (MRBC) of Sault Ste. Marie, Michigan, working jointly with the First Marine Expeditionary Force Engineer Group and the Naval Mobile Construction Battalion 7 (Seabees), has completed one of the biggest projects of its kind since World War II. The 1437th MRBC lent its experience and equipment in float bridge building to construct a 762-foot long Mabey-Johnson bridge across the Tigris River at Zubaydiyah. This is the longest floating span built in Iraq by military engineers. The bridge is a new type used by U.S. forces, and a representative of Mabey and Johnson Ltd. of England was on-site to assist with technical information throughout the construction.

Along with the 1437th MRBC, the Marine engineers, and Seabees, the project was assisted by a diving section from Naval Mobile Construction Battalion 133, Naval Construction



Military engineers from the Army, Navy, and Marine Corps begin construction on a float bridge across the Tigris River.

Support Team 2, Amphibious Construction Battalion 1, and Amphibious Construction Battalion 2.

Coalition forces had destroyed the original bridge across the Tigris River at Zubaydiyah to deny its use by Iraqi forces. Though the bridge wasn't critical to the movement of coalition forces toward Baghdad during the war, it was rebuilt to restore a major transportation route used by civilians and coalition forces. The project, which took two weeks to complete, was opened on 28 June 2003.

The 490-ton bridge consists of six sections linked together—two 40-meter sections anchored at either bank, with four 33-meter sections pinned and welded in the middle. The sections sit atop 100-meter-long pontoons, which were then anchored to the river bottom through a kedge anchor system consisting of 20 anchors, each weighing 500 pounds. The



A Seabee crane helps attach a section of Mabey-Johnson bridge to a pontoon.

faster the current, the deeper the kedge anchors dig into the river bottom, stabilizing the bridge's position.

The 1437th MRBC used many of its skilled boat operators throughout the project to place the pontoons for pinning and welding and to hold the bridge in place until the anchor system was complete. The current was swift, and it took all of their skill to keep the bridge steady. Steadying the pontoons to get the separate bridge decking in place was the critical part of the job. If anchoring hadn't gone well, the bridge wouldn't have been built. Soldiers had to keep adjusting their boats so the Seabees could drop the anchors.

The 1437th also ferried construction equipment across the Tigris River to facilitate the construction of the far shore bridgehead. Another mission the unit performed with Marines from the First Marine Expeditionary Force Engineer Group was using 28-foot powerboats to provide river reconnaissance and security for the bridge project. This allowed the bridge crews to work without being fired upon; no hostile incidents occurred at the site.

The last bridges built in combat by the Sault Ste. Marie unit were treadway bridges across the Puk Khan and Humsong Rivers by the 1437th Engineer Treadway Bridge Company during the Korean War. One of those bridges was built within



Engineers drive in the final pins to connect the near shore with the rest of the bridge.

800 yards of combat between Republic of Korea and North Korean troops.

Sergeant First Class Milligan is the 1437th Multirole Bridge Company's mess chief. The unit was mobilized from the 107th Engineer Battalion in support of Operation Iraqi Freedom from January 2003 through July 2003.

The Engineer Writer's Guide

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in PowerPoint. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of

your past assignments, experience, and education; your mailing address; and a fax number and commercial daytime telephone number.

Include a statement with your article from your local security office that the information contained in the article is unclassified, nonsensitive, and releasable to the public. Not only is *Engineer* distributed to military units worldwide, it is also available for sale by the Government Printing Office.

We cannot guarantee that we will publish all submitted articles. They are accepted for publication only after thorough review. If we plan to use your article in an upcoming issue, we will notify you. Therefore it is important to keep us informed of changes in your e-mail address or telephone number. All articles accepted for publication are subject to grammatical and structural changes as well as editing for style.

Send submissions by e-mail to <pbdb@wood.army.mil> or send a 3 1/2-inch disk in Microsoft Word, along with a double-spaced copy of the manuscript, to: Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929.

Note: Please indicate if your manuscript is being considered for publication elsewhere. Due to the limited space per issue, we do not print articles that have been accepted for publication by other Army professional bulletins.

A Multifunctional Engineer Battalion

By Lieutenant Colonel Ed Jackson



The 54th Engineer Battalion (Corps)(Mechanized) (the "Dagger Battalion") performed every type of engineering support for the 3d Infantry Division (3ID) and 3d Armored Cavalry Regiment (3ACR) in Operation Iraqi Freedom from 21 March 2003 until its relief in place at the end of May. Whether it was combat, topographic, or general engineering support, the soldiers and attached members of the 54th did it all.

On 8 January 2003, the 54th was alerted for deployment to Kuwait in support of Operation Iraqi Freedom. Within five days, the battalion had assembled its companies and loaded its equipment on the train for its journey toward Baghdad. The 54th is assigned to the 130th Engineer Brigade, V Corps, in Bamberg, Germany. It has developed a training support relationship with the divisional cavalry squadrons of the 1st Infantry Division and 1st Armored Division, the 173d Infantry Brigade (Airborne), and the Allied Command Europe's Allied Mobile Force (Land). During Operation Iraqi Freedom, the battalion supported 3ID in much the same fashion. Headquarters and Headquarters Company (HHC) and Bravo Company, 54th Engineer Battalion, and two Reserve Component multirole bridge companies (MRBCs) were attached to the Raiders of 1st Brigade Combat Team (1BCT). Alpha Company was attached, for combat operations, to the Spartans of 2BCT, and Charlie Company to the Sabres of the 3d Squadron, 7th Cavalry Regiment. Throughout the war and

subsequent stability operations and support operations (SOSO), the 54th gained and lost numerous company- and detachment-sized forces, and changed colonel-level commands nine times.

Crossing the Berm

On 21 March, the 54th crossed into Iraq with the 3ID. The mission of breaching, marking, and controlling five lanes through the complex border obstacle fell to 1BCT. The 54th Engineer Battalion (-), attached to 1BCT, served as the crossing area engineer. Marking breach lanes and manning traffic control points, the battalion managed traffic across the border for the majority of 3ID and several corps and theater enablers. The battalion's Bravo Company, the 1st Platoon of the 3d Military Police Company, and elements of the 299th MRBC manned traffic control points on both borders, ensuring smooth traffic flow and rapid vehicle recovery operations to keep the lanes clear. Using shipping containers mounted on MRBC common bridge transporters twelve feet above the ground and marked with orange panels, our soldiers funneled traffic from numerous unit staging areas and sent them onward to Iraq. Within hours, several thousand coalition vehicles streamed across the border. The soldiers in the 54th assured the mobility of 3ID forces, setting the conditions for rapid momentum in the initial stages of Operation Iraqi Freedom.

Attacking Into Iraq

Crossing the Iraqi border, the battalion moved quickly across open desert to keep up with the attack. Our routes were primarily along unimproved roads, which became a challenge for many of the MRBCs. The battalion was tasked to mark one of the two main supply routes for follow-on forces. The battalion also provided Team Panther to 3d Battalion, 69th Armor Regiment, and then to 317th Engineer Battalion, to clear Jalibah and Tallil Airfields in southern Iraq. Before combat operations, the battalion formed Team Panther, consisting of two M1A1 Panther II systems, a heavy equipment transporter, and a command and control high-mobility multipurpose wheeled vehicle (HMMWV). Team Panther leaders developed battle drills to maximize coverage of the roller team and to allow rapid connection and disconnection of the Panther's mine rollers. The Panthers self-deployed across the border with the roller nose cone attached. The team's mission was to clear unexploded ordnance (UXO) and land mines on both airfields. The 3ID planned to use Jalibah as a forward area refueling point to push attack aviation assets forward during the first day and Tallil as a logistics base throughout the rest of the operation. In 13 hours, the team cleared and proofed an area ten times larger than an entire combat engineer company could accomplish in the same time. Although the Panther system has long been used in Balkan area clearance operations, this is the first time the system was used in combat.

Actions at An Najaf

After three days of continuous movement through traffic jams, enemy contact, and a dust storm, the battalion finally reached Tactical Assembly Area Raiders, outside An Najaf. There, the 54th built survivability positions with assigned armored combat earthmovers and dozers from the attached MRBC units. The battalion recovered vehicles and dug a mass grave for Iraqi soldiers killed in initial combat operations outside An Najaf. The battalion also



The Panther was used in combat for the first time.

conducted bridge reconnaissance in support of combat operations in An Najaf. At Objective Jenkins, Iraqi paramilitary forces had damaged a reinforced concrete bridge over the Euphrates River, threatening to trap U.S. forces in enemy territory. The 54th sent in its recon-naissance team, equipped with the engineer reconnaissance kit. The unit sent detailed information on the bridge to the Engineer Research and Development Center (ERDC) at Vicksburg, Mississippi, for detailed analysis and a solution. Although the solution was never implemented, we validated our reachback connectivity from Iraq to Mississippi.

Attacking to Objective Peach

Early on 1 April, the battalion attacked with 1BCT through the Karbala Gap to the Euphrates River. The 299th MRBC provided rubber assault boats, which the 11th Engineer Battalion used in the assault to ferry infantry troops across the river, under fire, to secure the far side and neutralize explosives on the fixed bridge. Unfortunately, retreating Iraqi soldiers detonated explosive charges, causing minor damage to one side of the bridge. The battalion again conducted a technical reconnaissance of the bridge, this time under mortar and small arms fire. The team transmitted the data via satellite to ERDC, which responded with a technical solution of using a single-story medium girder bridge. The 299th MRBC easily installed the bridge, bringing it up to full operational capability. In addition to the hasty repair of the fixed bridge, the 299th MRBC built a 200-meter float bridge, at night, near the fixed-bridge site. In a single day, 299th soldiers emplaced every piece of Class VII bridging they had carried across the border.

Actions at Objective Peach

Following the initial assault at Objective Peach, the 54th established a detailed traffic control plan and emplaced traffic control points throughout the bridgehead. Attached to the Engineer Brigade of 3ID, the 54th served as the crossing area engineer headquarters, executing the division and corps movement plan across the Euphrates River and



Soldiers observe damage at Objective Peach.



A HMMWV crosses a newly completed medium girder bridge at Objective Peach.

into Baghdad. The battalion also built the division enemy prisoner of war compound and operated it for approximately two weeks until relieved by 3ID military police forces. The fighting at Objective Peach inflicted great damage and loss of life on the local civilian population. In response, the 54th Engineer Battalion established an internal, ad hoc Civil-Military Operations Center. A small team met with local civilians to show them that the U.S. Army was there to help, not to hurt, innocent civilians. As a result of their efforts, the battalion identified and cleared a number of UXO fields and treated a large number of civilians who had been injured during the battle. Their actions helped create and maintain a friendly environment at the bridgehead.

Actions in the 3ID Rear Area

After several weeks of managing traffic, the 54th was given more responsibility in the 3ID rear area. The battalion reorganized under the 937th Engineer Group and became responsible for traffic control, security of the bridgehead east of the Euphrates River, maintenance of existing military bridges, and construction of a second military float bridge. The 671st MRBC built the bridge at Objective Chamberlain, outside a small farming community about 20 kilometers upstream from Objective Peach. The 3ID needed additional supply routes across the Euphrates River for enhanced logistics flow and chose this site because of its proximity to the division rear area and to Baghdad International Airport. The 671st overcame significant obstacles during bank preparation to emplace the bridge, which became more popular with the local populace than it was with 3ID.

The 54th reorganized HHC as a combat force and assigned it the mission of securing the eastern side of the bridgehead. The company had command and control of a Linebacker air defense artillery platoon, an Avenger air defense artillery

section, and two battalion Panther II crews. HHC reorganized internally as well and integrated the entire support platoon into the security role. HHC conducted presence patrols, performed cordon-and-search operations, and operated traffic control points along the main supply route across Objective Peach. While HHC managed the eastern shore, Bravo Company conducted security patrols and cordon-and-search operations along the western banks of the river. Upon the return of Alpha Company to the 54th, they were given similar responsibilities in support of the Objective Chamberlain bridgehead. Alpha and Bravo Companies uncovered vast amounts of weapons and ammunition during search operations, including more than 33 Seersucker surface-to-surface missiles in an abandoned warehouse. These were destroyed with the assistance of the 937th Explosive Ordnance Disposal (EOD) Team. Bravo Company also cleared a runway for the 1st Battalion, 101st Aviation Regiment of the 101st Airborne Division. The 814th MRBC joined the 54th and performed traffic control and managed the digging assets across the division rear footprint.

Supporting 3ACR in Western Iraq

In late April, the battalion was reassigned to the newly arrived 3ACR in Area of Operations West. Charlie Company remained with 3-7 Cavalry Regiment for continued operations near Baghdad International Airport. For the mission in support of 3ACR, the battalion had control of a terrain team from the 320th Engineer Company; the 761st Ordnance Company (EOD); and Alpha Company, 142d Engineer Battalion, from the North Dakota Army National Guard. Our support of 3ACR was not only combat engineering but also infantry- and construction-related projects. Because the area of operations extended from the borders of Syria, Jordan, and Saudi Arabia to the outskirts of Baghdad, we

assigned engineer companies to the maneuver squadrons. Alpha Company was attached to 1st Squadron for operations along the Syrian border and Bravo Company to the 3d Squadron for operations along the Jordanian border. The 2d Squadron did not receive any 54th Engineer Battalion augmentation since it had the 43d Engineer Company, which is organic to the regiment. The battalion tactical operations center (TOC) colocated with the regimental TOC in Ar Ramadi, and the remainder of HHC located at Al Asad Air Base, about two hours west, where it supported the Support Squadron and 4th Squadron of 3ACR. Each company was augmented with an EOD team to destroy caches and clear UXO.

Commanders had instructions to be the total force engineer for their squadron commanders. Combat engineers served as construction engineers building field latrines, hand-washing stations, and showers. They set up minor power grids, rewired lights and sockets, repaired air conditioners, and installed ceiling fans.

Engineers teamed with civil affairs teams for infrastructure assessments in local towns, looking at water and power production and distribution systems, sewage treatment facilities, and garbage collection. In addition, they identified numerous goodwill projects such as the construction of soccer fields, playgrounds, and central parks. Engineers assessed facility damage to schools and hospitals. HHC hired the former Al Asad base engineer (an Iraqi) and a team of local nationals to get the facility operating at prewar standards. Companies also operated traffic control points, conducted presence patrols and search operations, and helped civil affairs teams with civil servant wage distribution.

The battalion served with the 761st Ordnance Company (EOD), which embraced our engineer/EOD integration. Although there were not extensive combat operations at Area of Operations West, there were numerous UXO, arms and ammunition caches, and major ammunition supply points in the sector. Leaders developed plans to consolidate and remove captured ammunition. Engineers were used effectively to handle UXO inside towns and the many ammunition supply points looted by locals. Using FalconView® software, the battalion also developed a tool for tracking the numerous cache locations to template and refine search operations for engineers and maneuver forces. The 320th Engineer Company produced topographic products for the squadrons, to include town studies, infrastructure analyses, border-crossing analyses, population density studies, and detailed products to help units plan raids and seizure operations. Alpha Company, 142d Engineer Battalion, supported the regiment through force protection improvements and quality-of-life upgrades at the regimental TOC and the regimental rear area at Objective Redskins and for the troops of 1-5 Field Artillery Battalion.

The 54th Engineer Battalion S3 established an internal construction management section (CMS) that established contracts for improved life support for the regimental TOC and for the soldiers of the 1-5 Field Artillery Battalion, living



Soldiers construct a latrine at Ar Ramadi, west of al Fallujah.

near the university in Ar Ramadi. Improvements included emplacing gravel, paving, installing an improved power grid, and air-conditioning tents and dining facilities. The battalion exercised engineering muscles rarely used in peacetime. With help from the 130th Engineer Brigade CMS and a small U.S. Army Corps of Engineers Forward Engineer Support Team (FEST), the battalion made great strides in engineering assistance to Area of Operations West and 3ACR before our relief in place by the 122d Engineer Battalion (Corps) (Wheeled) in late May/early June. Our time with 3ACR reinforced the need for engineer units to supply the full spectrum of engineer services to the maneuver force. These missions tested our creativity, imagination, and ability to make something out of nothing.

Conclusion

Soldiers from the 54th Engineer Battalion executed tasks covering the full spectrum of engineer operations in Operation Iraqi Freedom, including combat, construction, and topographic engineering. The flexibility the battalion gave maneuver commanders helped assure mobility during high-intensity combat and SOSO. The ability to accomplish a myriad of tasks made the 54th a combat multiplier and a true multifunctional engineer battalion.



Lieutenant Colonel Jackson is the commander of the 54th Engineer Battalion. He previously served in engineer staff positions at Personnel Command; in Korea; and in Europe; as well as in the 4th Engineer Battalion at Fort Carson, Colorado; the 554th and 5th Engineer Battalions at Fort Leonard Wood, Missouri; and the 41st Engineer Battalion at Fort Drum, New York. Lieutenant Colonel Jackson is a graduate of Clemson University.



FIRST ENGINEER STRYKER UNIT

By Sergeant First Class Rhonda M. Lawson

It's not unusual to see an engineer element accompany an infantry unit on a mission. Even in the mountains of Afghanistan, engineers are frequently called on to clear mines and destroy weapons caches. However, a Fort Lewis, Washington, unit is breaking ground as the only engineer company assigned to the Army's new Stryker Brigade Combat Team (SBCT). Soldiers of the 18th Engineer Company, 3d Brigade, 2d Infantry Division (SBCT), have traded in their old light medium tactical vehicles (LMTVs) to become the only engineer company in the Army to drive the new Stryker engineer squad vehicle (ESV). This has changed the way they do business.

The ESV has the same power as the Stryker infantry carrier vehicle (ICV), making it easier to negotiate rough terrain. In the past, the unit would go on missions using an LMTV, which made keeping up with the infantry a challenge. Now it can negotiate the same terrain. Aside from power, the ESV shares other

similarities with its Stryker brethren: It is equipped with two Javelin missiles and a .50-caliber remote weapon station with a screen that allows the gunner to shoot from inside the vehicle. It also has a digital video camera that allows the driver to see what's going on outside the vehicle. In addition, the squad leader

has a screen that allows him to see what both the gunner and driver see.

The ESV makes it easier to use the unit's main tool, the mine-clearing line charge (MICLIC). This device contains nearly 2,000 pounds of C4 explosive, which shoots out 100 yards ahead of the vehicle to clear mines from a



A soldier checks the remote weapons station screen in the Stryker ESV.



The ESV can be outfitted with a mine plow (left) or a mine roller (right).

14-meter-wide area. Once the MICLIC is fired, another ESV with attached mine plow goes through the area, making sure all mines are cleared. Soldiers then follow, placing lane markers so the ICVs can pass safely. Ideally, all this can take

place without anyone leaving the vehicle. The ESV can also be outfitted with a mine roller to clear and proof mined areas.

The 18th Engineer Company, along with the rest of 3d Brigade, 2d Infantry

Division (SBCT), is now operating in Mosul, Iraq, as part of Task Force Olympia. The SBCT deployed to Kuwait in November, crossed into Iraq in early December, and conducted its first month of operations in Samarra and Ad

Duluiyah. The SBCT moved north to Mosul in January, where it and the rest of the units in Task Force Olympia replaced the 101st Airborne Division (Air Assault). This is the first operational deployment for the Army's first SBCT.



Sergeant First Class Lawson was the noncommissioned officer in charge of the 28th Public Affairs Detachment when she traveled with the SBCT for its precertification and certification exercises. She now serves with Task Force Sinai as part of the Multinational Force and Observers.

Photos by Sergeant First Class Rhonda M. Lawson.



A Stryker ESV is shown at the National Training Center, Fort Irwin, California.



Personnel Notes

Officer HRC Update

By Colonel Mike Rossi and Lieutenant Colonel Pete Mueller

"The future ain't what it used to be."

—Yogi Berra

We'd be surprised if at least two other contributors to this issue of *Engineer* do not lead off their articles with the same quote by the famous Yankee manager. In the time that passes between submitting this item and its publication, the Army leadership will make several decisions on the structure and mission of our active duty engineer battalions and brigades. These decisions will have a significant effect on the assignment options, command opportunities, and professional development timelines of our Corps. This article presents a snapshot of what we've learned from past selection boards, what we know today about professional development in our Corps, and initiatives we anticipate for the future.

Change, Change, Change

First, we're now HRC, not PERSCOM. On 2 October 2003, the United States Total Army Personnel Command (PERSCOM) and United States Army Reserve Personnel Command (AR-PERSCOM) were combined to form a single, unified command—the United States Army Human Resources Command. HRC is a result of the Army leadership's vision to streamline headquarters, create more agile and responsive staffs, reduce layers of review and approval, focus on the mission, and transform the Army. HRC's activation is the first step in consolidating personnel services throughout the Army.

What does it really mean from a personnel perspective to be an "Army at War – Relevant and Ready"? It means that we are *not* going about "business as usual." We are not simply thinking outside the box for academic purposes—we're creating policies and procedures which will ensure that we contribute to increased combat effectiveness and readiness, while enhancing your stability and predictability. It means that our No.1 priority is to support the Global War on Terrorism. We assign officers to meet Army priorities and requirements first, then we balance professional development needs. Deploying units will not deploy at less than full strength. Once deployed, we will not cause unit turbulence. It means that we slate the

best officer to a unit based on experience and skills. Officer preference is important, but it is not the driver.

When we can, we will support the high school senior stabilization program, *Joint Domicile*, and summer moves. It means we will not move you just because you've been on station a certain amount of time, and we will increase your opportunity to return to the same location. "Homesteading" is no longer bad—it is okay to stay at a location you enjoy, unless the needs of the Army or your professional needs require a permanent change of station (PCS). It means the personnel system now has a unit focus versus an individual focus. Rather than breadth, we look to develop more depth in an officer. We're looking to keep experts in their jobs longer.

Lieutenants

The great news for the Regiment and our future is that our lieutenants are getting the best professional development the Army can offer—operational experience. What's important for you is to learn as much as you can, do your absolute best, and do not be afraid to fail. Promotion rates to captain are near 99 percent and, once selected, your lieutenant Officer Evaluation Reports (OERs) are masked before future boards. You truly get a fresh start once you make captain.

As with junior captains, all your duties should be performed with the goal in mind of developing the skill sets you need to be a great company commander. These skills include leadership (platoon leader, executive officer), personnel (S1), training and tactics (assistant S3), planning and battle tracking (assistant brigade engineer, brigade engineer, assistant division engineer liaison officer, supply (S4), and maintenance (battalion maintenance officer). The more skills you master in these disciplines, the better commander you'll make. Even with the home-basing initiative, you can seek professional development jobs with a short-tour assignment or a PCS. Now is the time to jump on professional schools—such as the Airborne, Air Assault, and Ranger Schools and the Mechanized Leader Course.

Captains

Company command is the *critical node* in your career. A year in command is branch qualification, and boards have shown no prejudice to 1-year commanders on past boards. Command queues are well over 3 years in all, but a very few installations and captains should expect their command tours to be closer to 1 year rather than the traditional 18 months. Our position at the Engineer Branch is that the boards look for two command reports rather than the number of months an officer commanded. As explained above, all lieutenant and captain development leads to it and the level of success you achieve as a commander defines your near-term opportunities—nominative assignments, advanced civil schooling (ACS), and promotion to major. Knowing this, battalion commanders bear tremendous responsibility to cycle junior officers into "tailor-made" developmental jobs; to coach, train, develop, and spot-

light serving company commanders; to advise senior raters as to who are the absolute best of their commanders; and to counsel their commanders about follow-on opportunities to serve the Regiment and the Army.

The jury is out on the Engineer Captain's Career Course (ECCC) and what shape and form it will take. A decision after this writing, but before publication, may render the discussion below obsolete, but here is the current thinking: From the assignment perspective, there are really two options available to the officer corps—a PCS or a temporary change of station (TCS) for non-home-based officers or temporary duty (TDY) and return for home-based officers. The figure on page 50 captures the timelines for the two options. In this case, "CC" is the U.S. Army Training and Doctrine Command common core curriculum; "BS" is branch-specific courses, which are taught at the U.S. Army Maneuver Support Center, Fort Leonard Wood, Missouri, for engineers; and "CA" is combined arms experience, which is taught at the National Training Center, Joint Readiness Training Center, or Combat Maneuver Training Center.

ACS remains a success story for the Regiment. Roughly 80 percent of our captains seek and receive master's degrees while at the ECCC. In addition, we've had a number of captains pursue another ACS opportunity. This year—

- 20 will go to ACS then teach at the United States Military Academy.
- 13 will go to ACS with utilization in the U.S. Army Corps of Engineers (USACE).
- 5 will go to ACS at Georgetown with utilization on the Joint Staff.
- 1 will go to ACS at Harvard with follow-on to the Army G3.
- 1 is an Olmsted scholar.

No other branch has had as much success this year in the ACS arena.

Once a captain completes company command, he or she can expect reassignment to one of the many jobs that meet other critical Army needs. Those assignments include ACS, Reserve Officer Training Corps (ROTC), Active Component-Reserve Component (AC-RC), Project Warrior, small-group instruction, or recruiting company command. In each case, officer preference is considered, but the needs of the Army must be first met.

Majors

The big news for senior captains and majors is the Army's Universal Military Education Level 4 (MEL4) initiative. Greybeards will remember MEL4 as Command and General Staff College (CGSC). More recently, the Fort Leavenworth, Kansas, experience is known as Command and Staff College (CSC). In the future, it will be known as Intermediate Level Education (ILE). In the past, we selected roughly 50 percent

of a year group (YG) of officers to attend resident CSC; the remaining 50 percent completed the course by correspondence. Starting with YG94 in the fall of FY05, 100 percent of officers will attend some form of resident ILE. For the operations career field—that's engineers—this means a PCS for 10+ months to Fort Leavenworth. The Engineer Branch will schedule majors in one of the first two available classes to their YG. We will only support deferring attendance twice in very rare occasions or, obviously, for stop loss/stop move. If you are YG93 and not selected for resident CSC, you must complete the course by correspondence before your lieutenant colonel board or, as history has shown, you will not be selected for promotion.

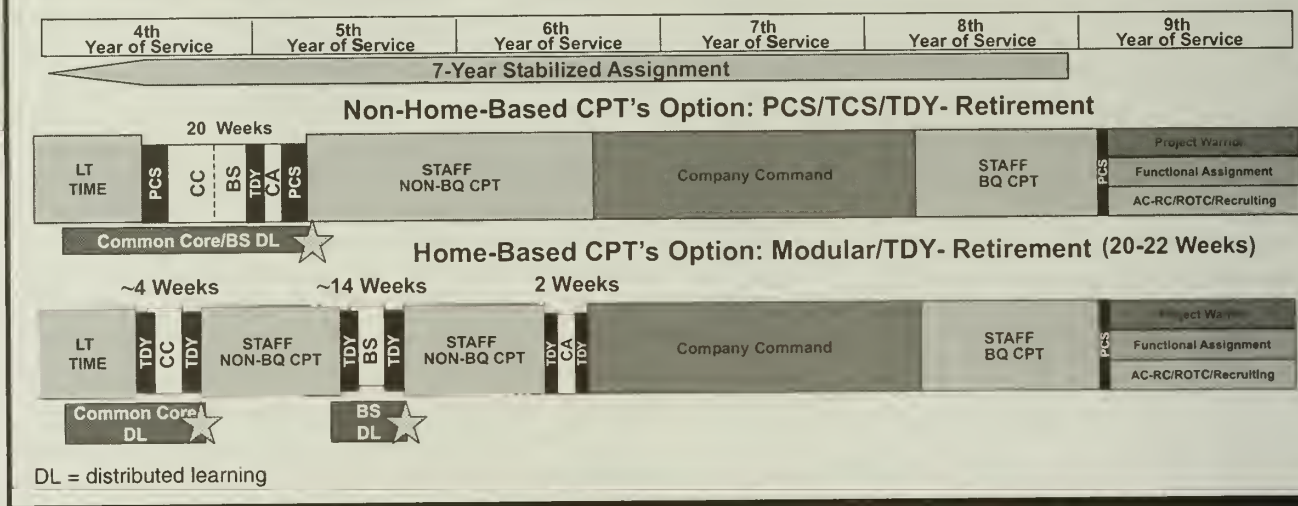
The results of the last four lieutenant colonel boards have shown that the key to promotion is performance as a major. Resident or nonresident CSC, the type of branch-qualifying (BQ) majors' job, or company command reports are negligible factors in comparison. BQ positions for majors are shown in Department of the Army Pamphlet 600-3, *Commissioned Officer Development and Career Management*, and are assistant division engineer, battalion- or brigade-level S3/executive officer, regimental engineer (Ranger, cavalry regiments), Special Forces group engineer, Director of Public Works (DPW), or Deputy District Engineer. Once again, performance as a major—shining periodically in your reports, particularly in BQ positions—is the key to making lieutenant colonel.

Lieutenant Colonels

If you are a lieutenant colonel in today's Army, you are a success! My sense of the boards, regulations, guidance, and selection history is that all are geared toward making you a lieutenant colonel; if you don't make it, both you and the Army are disappointed. But everything after lieutenant colonel is gravy—battalion command, colonel, War College, colonel command, and beyond. The Army knows there are more officers qualified for these selections than there are positions available and makes its best effort to pick the officers to serve at these levels. They are all tremendously tough cuts.

Battalion command remains the most selective gate in our Regiment. Roughly 40 percent of a cohort YG will be selected for lieutenant colonel command. With rare exceptions, all centrally selected (command selection list [CSL]) battalion commanders will attend Senior Service College (SSC)—the War College. Also rare is when a non-CSL battalion commander will be selected for resident SSC. So, if you're not a battalion commander, you should consider the nonresident SSC option, if offered.

Lieutenant colonels serve the Army. We'll always do our best to find the right job for senior officers, to include joint, Department of Defense, or Department of the Army staffs; DPW; training support battalion; and provisional battalion command. We'll spend much time seeking key strategic jobs



Blended Modular Captain's Career Course

for our outgoing battalion commanders to capitalize on their experience and professionally develop them for future service.

Colonels

As of February 2004, there are 185 active duty colonels on the rolls of the Engineer Regiment, serving our nation in a time of war. This includes the addition of 19 promotable lieutenant colonels announced in December 2003. Considering anticipated retirements through next summer, our rolls could drop below 160. Our colonels are assigned to SSCs and worldwide in 110 authorized engineer colonel and numerous branch-immaterial positions. Authorizations for continental United States (CONUS) DPWs were dramatically cut during the Total Army Analysis 2009 (TAA09) process. In 2003, there were 12 colonels assigned to DPW positions within CONUS. The Personnel Management Authorization Document for 2005 includes only 4 CONUS DPWs. The other 8 DPW positions are being transformed into Department of the Army civilian positions.

In 2003, the Regiment's promotion rate to colonel was lower than the Army average and about 45 percent less than in recent years. Promotions within branches of the Army are tied to both structure and inventory or, more simply, authorized requirements and the health of a YG or population. Reductions in authorizations in combination with a larger-than-average population can translate into a reduced requirement for BS promotions as determined by the Army G1. This can also translate into increased requirements for branches that may experience the opposite trend.

One impact the field may have on this is the timely submission of retirement requests. Late requests could mean that a snapshot before a promotion board could reflect an unusually healthy population, with follow-on consequences for the

Regiment. Army Regulation 600-8-24, *Officer Transfers and Discharges*, dictates that "voluntary retirement requests may be submitted up to 12 months before the requested retirement date and not later than 6 months prior to the projected start date of transition leave."

The impacts of the Army's priorities—fighting the Global War on Terrorism and The Way Ahead Campaign—are also affecting the management and assignment priorities for engineer colonels. The establishment of the USACE Gulf Regional Division and the USACE District in Afghanistan are examples of five new 21Z (combat engineering senior sergeant) Directed military overstrength (DMO) assignments. Along with the rest of the Regiment, in assigning engineer colonels, we must first consider the priority needs of the Army and assign officers based on depth versus breadth of experience. The Army's stabilization plan, along with stop loss/stop move for deploying units, will impact colonels along with the rest of our soldiers. CSL brigade-level commanders could see command deferments based on timing of unit deployments for contingency and combat operations.

The Glass Ball

Battalion and brigade commanders are accustomed to juggling numerous "glass balls"—maintenance, training, and personnel come to mind immediately. And while these are all absolutely critical, commanders and units can usually overcome shortcomings and mistakes in these areas. Last quarter is soon forgotten, and you focus on the future. Writing OERs and managing your (and your rater's) Senior Rater Profile are *THE* glass ball. The reason is simple—mistakes last forever! A poorly written report will remain in an officer's file throughout his career and will have an influence on every board. You must get this right. We've provided a primer on writing an effective OER on the Engineer Branch home page. The link is

<https://www.hrc.army.mil/OPeng/OERinfo.htm>. There are examples of various comments with the intended board effect, as well as thorough explanations.

The most important take-away from that primer is that although a center-of-mass report is not a discriminator for most boards, not all center-of-mass reports are viewed equally. It is very important that you include the following in each narrative: enumeration, promotion potential, schooling recommendations, and next command/position recommended. A rater or senior rater may elect to leave one or more of these four components out of a narrative, but they should understand that they risk sending an unintended (and not positive) message to a board. Rated officers should watch for these items in their OERs and question their rater/senior rater if they notice an omission during their counseling. The omission may be intentional, and it's certainly within the purview of the rater/senior rater to make this call. Or the rater/senior rater may have unintentionally left these comments out and can add them as a result of this dialogue.

Additionally, senior raters need to amplify their potential box checks by using the narrative to clearly send the appropriate message to selection boards. Board members relate that the first and last lines in the senior rater's comments are the most important factors in their assessment—so spend time on these portions. Some senior raters fill their box and hide potential comments. This is not good (don't make it time-consuming or difficult for the board members). A center-of-mass OER with the right comments about potential and future assignments is more valuable than an above-center-of-mass report that doesn't enumerate performance or contain key bullets about the ability to command or about school selection.

Communications

Our tool for communicating with you is the Internet and Army Knowledge Online (AKO). If we need to contact you specifically, we'll e-mail you via your AKO account address.

We cannot recommend more highly that you forward your AKO account to your work account address, or that you check your AKO inbox regularly. Often, we'll notify you about assignments, boards, corrections, or questions on your file by e-mail. It begins the discussion between you and your assignment officer.

We update elements of our branch Web page weekly. In it, we provide links to board results, dates for branch visits, hot or late-breaking assignment opportunities, or useful personnel tools for your use. The link is <https://www.hrc.army.mil/OPeng/enmainpg.htm>. The homepage also leads you to the Automated Preference System and allows you to see the available assignments for your grade and one grade up, real time (you see them when we see them). Through this system, you can open the dialogue with your assignment officer on your preferred next assignment.

The Officer Engineer Branch exists to serve you, the Regiment, and the Army. Essayons.

Colonel Rossi has been the Engineer Officer Branch Chief, HRC, since June 2002. His assignments include company commander, battalion executive officer, and G3 Training in the 101st Airborne Division; commander, 65th Engineer Battalion, 25th Infantry Division (Light); and Deputy District Engineer-Military for the Sacramento District, USACE. He holds master's degrees from MIT and the National War College and is a professional engineer in the Commonwealth of Virginia.

Lieutenant Colonel Mueller has been the Engineer Colonels Assignment Officer, HRC, since July 2003. Assignments include company commander, 24th Infantry Division (Mechanized); assistant division engineer and battalion executive officer, 101st Airborne Division; Congressional Fellow; and commander of the Charleston District, USACE. He holds a master's from MIT and is a professional engineer in the Commonwealth of Virginia.

Army Values

"We are, have been, and will remain a values-based institution. Our values will not change, and they are nonnegotiable. Our Soldiers are warriors of character. They exemplify these values every day and are the epitome of our American spirit. They are the heart of the Army."

—General Peter J. Schoomaker, Army Chief of Staff, arrival message July 2003

Loyalty - Bear true faith and allegiance to the U.S. Constitution, the Army, your unit, and other soldiers.

Duty - Fulfill your obligations.

Respect - Treat people as they should be treated.

Selfless Service - Put the welfare of the nation, the Army, and your subordinates before your own.

Honor - Live up to all the Army values.

Integrity - Do what's right, legally and morally.

Personal Courage - Face fear, danger, or adversity.



Personnel Notes

Enlisted HRC Update

By Lieutenant Colonel Margaret W. Burcham

This past October, PERSCOM became the Human Resources Command (HRC), and the Enlisted Engineer Branch turned over a few personnel as well. The assignment managers are here to serve you. So if you have questions, please contact them through our Web site at <https://www.hrc.army.mil>.

MOS Changes

In August 2003, the Deputy Chief of Staff, Army G1, approved the deletion of military occupational specialty (MOS) 21F, crane operator. All duties currently performed by MOS 21F personnel will be incorporated into MOS 21J, general construction equipment operator. This change will take effect in fiscal year (FY) 2006.

Promotions

The conditional promotion—that is, a 1-year period to pin on the next rank without meeting Noncommissioned Officer Education System (NCOES) requirements—is suspended until further notice. Soldiers may now pin on rank as soon as they have orders, following success at the promotion board and adequate promotion points, regardless of their completing the applicable NCOES. However, sergeants must complete the Primary Leadership Development Course (PLDC), staff sergeants must complete the Basic Noncommissioned Officer Course (BNCOC), and sergeants first class must complete the Advanced Noncommissioned Officers Course (ANCOC) before they will be considered for promotion to the next higher rank. The calendar year (CY) 2004 Master Sergeant Promotion Board convened from 3 - 27 February 2004. The next board, FY05 Master Sergeant Promotion Board, will convene from 5 - 29 October 2004.

Army Knowledge Online

We at HRC are making greater and greater use of Army Knowledge Online (AKO). It is especially important that your AKO account be forwarded to your work account if you have one or that you have access to AKO and check your account from time to time. For soldiers who are deployed, it is our

primary means of contact. We will notify you of assignments or provide options when we can. Soldiers should also use the Army Satisfaction Key (ASK), found on the HRC Web site to update assignment preferences. We use these preferences in making many decisions regarding a soldier's next assignment. A great new tool for NCOs on AKO is access to their Enlisted Record Brief (ERB) via our Web site. In March 2004, AKO will be used as a medium for four new personnel initiatives:

- E-mail notification of assignment, deletion, or deferment actions, which will eventually replace HRC-GRAMS (formerly PERSGRAMS).
- E-mail reminders to update assignment preferences and contact information in ASK within 3 months of permanent change of station (PCS) and again 18 months before the date eligible for return from overseas (DEROS) for soldiers outside the continental United States (OCONUS) or after 2 years time on station (TOS) for soldiers in the continental United States (CONUS).
- E-mail acknowledgements when volunteer or assignment preference information is updated in ASK.
- Ability to view Personnel Key Information through ASK. This includes spouse information, MOS, NCOES history, Enlisted Force Management Plan (EFMP) status, assignment location and report date, and pending training course information.

Retention

Many new bonuses are in effect now, especially for those currently deployed in support of Operation Iraqi Freedom and Operation Enduring Freedom, as well as those volunteering to remain in, or reenlist for, Korea. Learn more about these from your unit retention NCO.

Assignments

As you read about force stabilization below, you will see that overall the pace of PCSs will be slowing down. We will tend to leave soldiers where they are unless there is a compelling need to move them, such as for promotion, DEROS, schooling, or to fill a higher-priority position. We will attempt to increase the *depth* of a soldier's knowledge and experience and be less concerned with increasing the *breadth* of that soldier's experience.

One assignment problem we are dealing with is that of back-to-back assignments, meaning an assignment to a deploying unit or to an unaccompanied tour within 1 year of that same kind of assignment. While we try to avoid this situation whenever possible, with the current pace of deployments and the fact that the majority of the Engineer Regiment has been deployed, it is not possible for us to completely avoid back-to-back assignments. Many of you have experienced this. Of course, we will work with soldiers who volunteer for these assignments.

Stop loss/stop move is in effect for units that are currently deployed as well as for those moving into Operation Iraqi Freedom Phase II and Operation Enduring Freedom Phase IV. This measure will remain in effect for those units until 90 days following their redeployment. If you are serving in a table of distribution and allowances (TDA) assignment or otherwise have not deployed, you should expect to be assigned to a deploying unit on your next assignment. We will attempt to assign redeployed soldiers to the TDA assignments to get recent combat experience into the training and recruiting base. Exceptions to this include the following:

- Soldiers currently programmed to end their 3-year recruiting tours this year have now been extended to a fourth year.
- Soldiers scheduled to complete their 2-year drill sergeant duties between 1 May 2004 and 30 April 2005 have been extended to a third year.

This is a temporary measure to ensure that we have adequate fill in those critical positions during this period of stop loss/stop move.

Several new Stryker Brigade Combat Teams (SBCTs) will be standing up over the next year, to include SBCT3, 1st Brigade, 25th Infantry Division; SBCT4, 2d Light Cavalry Regiment (formerly 2d Armored Cavalry Regiment); and SBCT5, 2d Brigade, 25th Infantry Division. Due to the extensive equipment fielding and training time required, soldiers assigned to these units must remain in place throughout a significant stabilization period of several years. Therefore, soldiers currently assigned to those units who do not have enough time remaining on their enlistment must either extend to meet applicable dates or will be reassigned to other units. Soldiers with questions regarding assignments to SBCTs should contact their assignment manager.

Force Stabilization

The Army has some great initiatives to increase unit readiness and to make it easier to have greater predictability in the lives of soldiers and their families. Force stabilization is a system designed to decrease personnel turbulence for units and set conditions for increased unit readiness, combat effectiveness, and cohesion.

Why Force Stabilization?

This initiative will—

- Increase overall Army readiness.
- Slow down the force (fewer PCS moves).
- Cause homesteading to become a *good* thing!
- Increase unit cohesion.
- Stabilize families and provide more predictability to soldiers.

How Does Unit-Focused Stability Work?

Beginning in October 2004, brigade combat teams will be set on 36-month life cycles, which will—

- Align the soldier's tour with the unit's operational cycle (36 months).
- Minimize soldier moves/losses for deployed units.
- Provide cohesion for all levels of soldiers and leaders.

There are three phases in the life cycle:

- **Reset** (30 - 90 days). This is the time following a major deployment and 90 days stabilization when soldiers who have reached their estimated time of separation (ETS) or are retiring will depart the unit, some will PCS to other assignments due to promotion or for professional development, and others will join the unit to replace the departed.
- **Training** (6 months). During this period, the unit will be at 100 percent strength and will train with set crews to perform its wartime mission. Training will be individual through collective and will wrap up with a certification exercise.
- **Ready** (25 - 29 months). Throughout this phase, the unit is available for employment.

One new initiative intends to place first-term enlistees, as well as newly commissioned lieutenants, at their first duty station for a total of about 7 years. During that time, the soldier may leave the base for deployments with their unit or TDY for schooling, but will then return to their initial posting. Families will remain at the initial post throughout the 7-year period, giving them continuity in their community and a sense of stability.

To learn more about force stabilization, visit the G1 Task Force Stabilization (TFS) Web site at <https://www.stabilization.army.mil>.

Lieutenant Colonel Burcham is chief of the Enlisted Engineer Branch at the Human Resources Command.

MOVING?

Did your unit move recently, or is your *Engineer Bulletin* addressed incorrectly? To correct your mailing address, send us the following information:

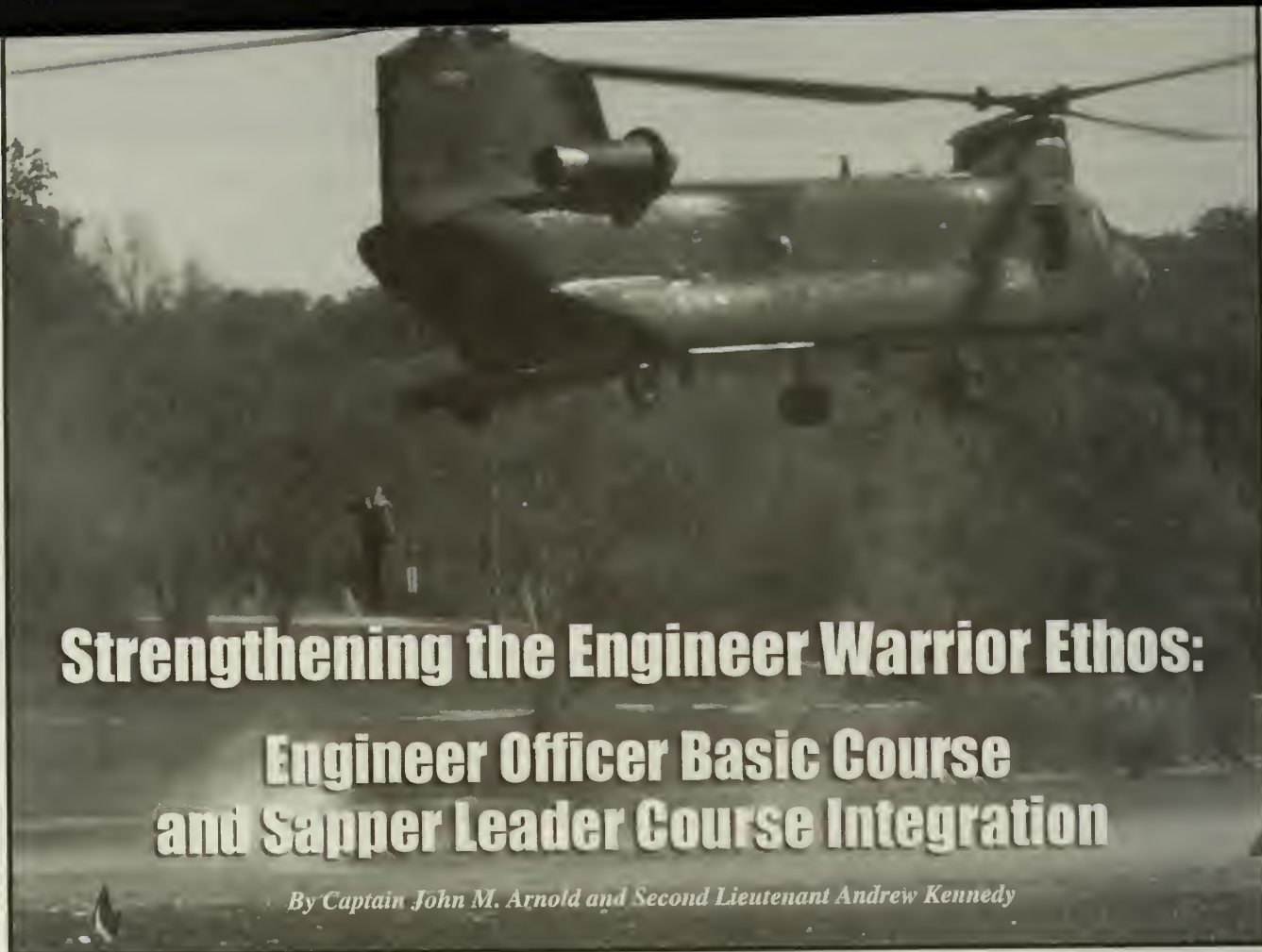
Old Address:

New Address:

E-mail: pbp@wood.army.mil

Telephone: (573) 563-4104, DSN 676-4104

Address: U.S. Army Maneuver Support Center, ATTN: ATZT-DT-DS-B (Engineer), 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929



Strengthening the Engineer Warrior Ethos: Engineer Officer Basic Course and Sapper Leader Course Integration

By Captain John M. Arnold and Second Lieutenant Andrew Kennedy

"Warrior Ethos—summarized in Army training material as a commitment to victory, an emphasis on mission, a refusal to quit, and a commitment to never leave an American behind—will also be emphasized after training is over in everything soldiers do in their regular units."

—General Kevin P. Byrnes

Commander, U.S. Army Training and Doctrine Command

Transformation has been the buzzword for the Army since the turn of the millennium. The 21st century Army has adopted a specific mentality for its leadership so the Army can become a faster, more lethal, and more adaptive fighting force. That mentality is known as Warrior Ethos, a mind-set for every soldier to be first and foremost an infantry soldier with fighting skills to match a tremendous fighting spirit. The new Basic Officer Leader Course, set to begin in the next few years, is an Armywide initiative to instill the Warrior Ethos from the beginning of an officer's career. But with the technical and diverse role of today's engineers, the Engineer Regiment is going one step further to merge Warrior Ethos with the modern, high-operational-tempo combat engineer. The U.S. Army Engineer School has started to send to the Sapper Leader Course (SLC) all lieutenants headed to combat engineer units after the basic course. Fueling this initiative is the need for officers who are as combat-ready as possible before arriving at their first unit. There is no better vehicle for this transformation than the SLC.

The SLC mission is to train engineers in the leadership skills, combat engineer and infantry battle drills, and specialized engineer and infantry techniques required for a sapper unit to perform as a member of a combined arms team.

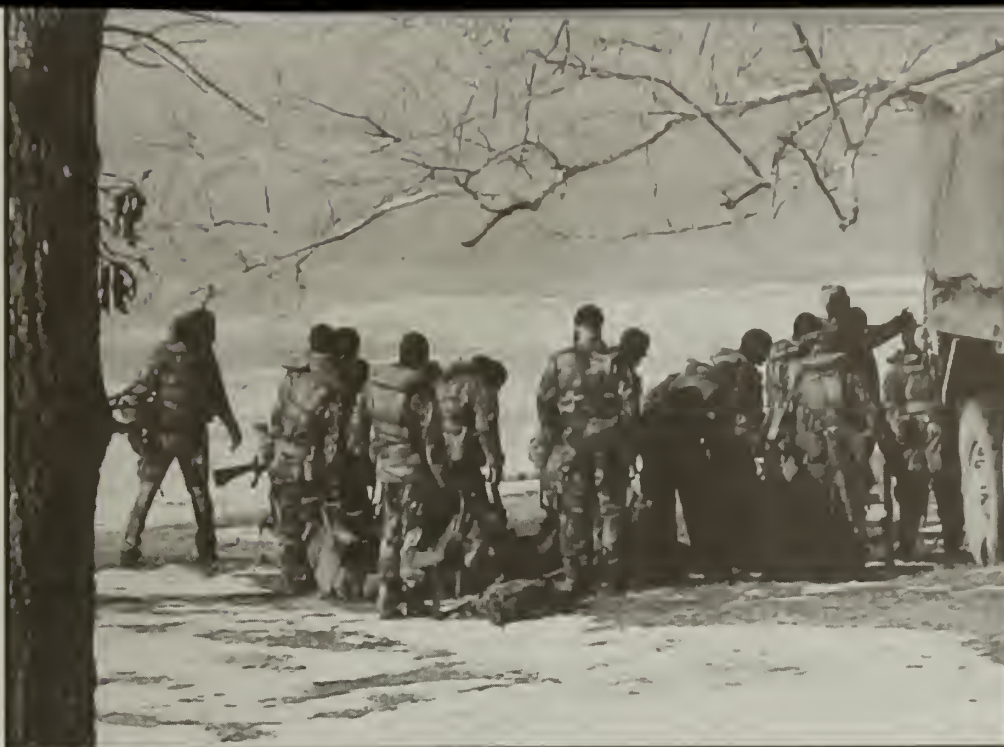


Soldiers take notes during a class at the SLC.

Embedded in their mission are the course objectives—to enhance technical proficiency, unit cohesion, confidence in self and equipment, and physical and mental toughness—everything the Warrior Ethos is and the engineer leader needs.

In today's contemporary operational environment (COE), every engineer is at the heart of operations to clear the way to victory for our maneuver forces, assuring their mobility. This environment has no battle lines and features smaller-scale force-on-force combat against an enemy who fights from the shadows. The Engineer Regiment has always played a significant role in combat and the SLC builds on that significance with real-world training under combat conditions. All training is current and relevant to operations in the COE alongside our combat arms brethren. On today's nonlinear battlefield, our soldiers need leaders who are more efficient, diverse, agile, and adaptive to rapidly changing situations. The Engineer School has taken that initiative to heart.

The SLC enhances the engineer and infantry skills of leaders in the Engineer Regiment. Instructors accomplish this through an intensive 2-week *general studies phase* that includes physical training, mountaineering, field-expedient demolitions, water-crossing operations, and a class on small arms used throughout the world. Other instruction includes classes on booby traps, field-expedient antennas, medical techniques, and air operations. Two important parts of the general studies phase are the 20-kilometer road march, said to be one of the toughest in the Army, and land navigation. The next 2 weeks are dedicated to the patrolling phase. This phase starts with instruction in hand-to-hand combat and operations order preparation before the class heads to the field for 10 days. Of those 10 days, one is a day of instructor-led missions, and the other is a practice day of student-led missions. The next 8 days are dedicated to a 4-day situational-training exercise and a 4-day field-training exercise. Between the exercises



The general studies phase of the SLC includes a road march.

is a class focused on teaching sappers to clean and prepare small game, enhancing their survival skills.

Since students do not have to be combat engineers to attend the course, the demolitions class starts with the basics of demolition calculations and placement. Sample problems, both on paper and in practical exercises, ensure that everyone has a working knowledge of demolitions. The next 2 days are spent at the demolition range, making field-expedient demolitions from materials that sappers may be limited to in real-world situations. Nontraditional emplacement and use of these charges are emphasized. The demolitions studied include field-expedient claymore mines, platter charges, shaped



Student sappers engage in hand-to-hand combat training.



Sappers practice the jumar ascent, using a mechanical device to climb a rope.

charges, satchel and crater charges, and low-standoff breaching charges that can be used indoors in urban warfare.

Every SLC student becomes proficient in mountain operations. Knots are the first part of instruction and every knot learned is used during mountain operations. Group

conduct solo, buddy, and stretcher rappels to move injured personnel down a cliff or other vertical obstacle. Students learn to construct a one-rope bridge to move gear or personnel across a body of water or large crevasse. The final rappel is made over a 90-foot cliff with full field gear while patrolling at night.



Students learn to cross large water obstacles effectively.

success often depends on properly tying one knot. On the rappelling tower, sappers learn the basics of descending and ascending vertical obstacles. A fall wall is used to teach them to properly belay climbers and to teach them what to do if they fall. Descent techniques include wall and free rappels performed with and without gear, fast rope descents, and the "Aussie" rappel, in which students descend face first. Ascent techniques include the prusik ascent, which uses a knotted rope attached to the rappelling rope, and the jumar ascent, which uses two mechanical devices in tandem. Sappers learn to build an A-frame to move gear or injured personnel up a cliff. They also learn to

Sappers learn to cross water obstacles effectively during the SLC. They also learn the correct use of Zodiac boats and crossing-site reconnaissance as well as other methods for crossing large water obstacles. After sappers receive instruction on water-proofing their gear and constructing poncho rafts, they swim in full gear, pulling their poncho rafts behind them. After the 1.5-kilometer swim across the Lake of the Ozarks Recreational Area, their success or failure at properly constructing the raft is apparent.

To aid sappers in survivability, the SLC covers the most common weapons used by our enemies. To overcome enemy-emplaced obstacles, sappers learn to identify enemy mines. (The SLC instructor has also taught the course to soldiers in Afghanistan.) Each student completes a mine identification lane that includes locating, marking, and identifying ten enemy mines. Sappers also learn to disassemble, assemble, and fire an AK-47 and to identify several types of small- and large-bore weapons used around the world. Firing an AK-47 on full automatic is an opportunity that most soldiers never have.

After the general studies phase of the course, sappers move into the 2-week *patrolling phase*, which focuses on troop-leading procedures, patrolling fundamentals, and applying the knowledge gained in the previous 2 weeks. Students spend 3 days in the classroom learning the principles of patrolling and presenting an operations order. Most participants are from different units, so there are no standard operating procedures at the SLC. Because of this, the operations order must include every step of the mission and state task and purpose, by name, for every individual. Actions on the objective alone usually take an hour to brief. This format is new to most sappers, so extra practice is required to complete the brief in the field successfully, especially after 3 days of no sleep and little food. The amount of sleep sappers get depends on how well everyone works together and how fast they move. If everyone works well together, the class may get 30 minutes of sleep a night. If a mission takes longer than expected, or if there is a break in contact during movement, it is unlikely that anyone gets any sleep. Each student "hits bottom" at some point, but most people have a few hours where they shine. Teamwork is essential to individual success during patrolling.

The evaluation system at the SLC is a combination of points and required training events, some of which are retestable. To graduate, a sapper must earn 700 out of 1,000 points and achieve a "GO" on all required events. An initial "NO-GO" in a required event does not mean immediate dismissal from the course, since there is still training value for everyone, even for students who may not graduate. Sappers who do not earn the required number of points, or who fail a required training event, still receive a certificate of completion. Students have the opportunity to retake written exams, the 20-kilometer road march, and the land navigation course, and successful retests can earn them the right to graduate. The largest attrition rate during the course is during land navigation. Injury or refusal to train are the only ways to be removed from the course. Not everyone can avoid an injury, but everyone should be able to overcome their personal fears and complete all training, especially if they plan to be leaders.

The SLC exposes sappers to technical issues from current operations in Iraq and Afghanistan. Some of these issues are sensitive site exploitation, intelligence gathering, and civil affairs integration. The course also trains students on new obstacles and how to recognize them in the field. One leader who recently deployed to Iraq credits the course's instruction

on improvised explosive device (IED) recognition for helping save his convoy from an attack. Before taking the course, the construction soldier admits, he didn't know what an IED was and probably wouldn't have known how to react. Because of his SLC training, however, his efforts saved the lives of soldiers in his convoy.

The SLC is a leadership course. Although some may mistake it for being just another Ranger program, it's much more focused on learning and instructor interaction to become the best engineer leader possible. The program involves more than just execution and evaluation; it is a detailed training program that doesn't end in the classroom. The SLC provides challenging experiences and demanding training that can tremendously increase leadership proficiency and minimize unit integration time. In today's Army, where a soldier may deploy the day he arrives at a new duty station, soldiers must be as combat-ready as possible. The SLC exposes students to the physical and mental rigors of combat under a controlled, learning-oriented environment. It's like performing on the battlefield without being on the battlefield.

Second lieutenants show up at their units and are expected to perform as the new task force engineer. They are going to tell the maneuver commander what he can and can't do for the combat forces, and the SLC gives the lieutenant the tools and, more importantly, the confidence to do just that. New lieutenants have always been thrown into task force engineer positions, but gone are the days of a 4-month integration and train-up period for deployments. When officers arrive at their units, they're caught up in other mission-essential tasks such as railhead and dock loading and unloading operations and other critical tasks for successful deployment. The SLC builds and intensifies a soldier's core learning, resulting in a more confident and technically competent leader.

The Army is focused on strengthening the Warrior Ethos mentality to better position its leaders for any mission on today's ever-changing battlefield. The Engineer Regiment is leading this change with the SLC and Basic Officer Leader Course integration as the tip of the sword. The Army's future depends on superb leadership, and by supplying today's leaders with tools like the SLC, those leaders can become more mission-ready than ever before. The integration of these two entities may be the key to the future operation of our Regiment as part of a dominating combined arms team. 

Captain Arnold is currently assigned to an Active Component-Reserve Component position supporting the 648th Engineer Combat Battalion (Mechanized), Georgia Army National Guard. When this article was written, he commanded Bravo Company, 554th Engineer Battalion (Engineer Officer Basic Course), Fort Leonard Wood, Missouri.

Second Lieutenant Kennedy, a graduate of the Sapper Leader Course, completed the Engineer Officer Basic Course in March 2004. He has a bachelor's in political science from Kansas State University.

THEATER CONSTRUCTION MANAGEMENT SYSTEM

By Mr. Chris Boyd

In September 2002, the U.S. Army Corps of Engineers (USACE) challenged the Army Facilities Component System (AFCS) branch of the USACE Engineering and Support Center, Huntsville, Alabama, to overhaul the planning and design tool called Theater Construction Management System (TCMS) version 1.2E. The Huntsville AFCS team released TCMS version 2.0 on 1 December 2003. This release is a complete overhaul of the TCMS structure and the underlying AFCS database, making version 1.2E obsolete and incompatible with version 2.0.

The significance of this overhaul relies on the knowledge of the underlying technology. The Construction Engineering Research Laboratory developed the early programming for TCMS more than 20 years ago to access the existing AFCS digital database. That version of the program was based on a Microsoft® disk-operated system that used external drives and was limited by floppy disks and hard drive space. The AFCS branch added functions and interface options within the 16-bit Microsoft Windows® operating system. However, each change was an add-on instead of an integrated, planned programming adjustment. This created an unstable operating environment and limited the enhancements that users needed. TCMS stayed 16-bit-based until 2003, even though 32-bit programming was introduced in 1995. This meant that version 1.2E and earlier versions of TCMS are limited to old and outdated commercial off-the-shelf (COTS) software, while the overhauled version 2.0 can interface with the latest version of Microsoft Project and AutoCAD® and run on a native Microsoft Windows XP environment. This lets users take advantage of current COTS.

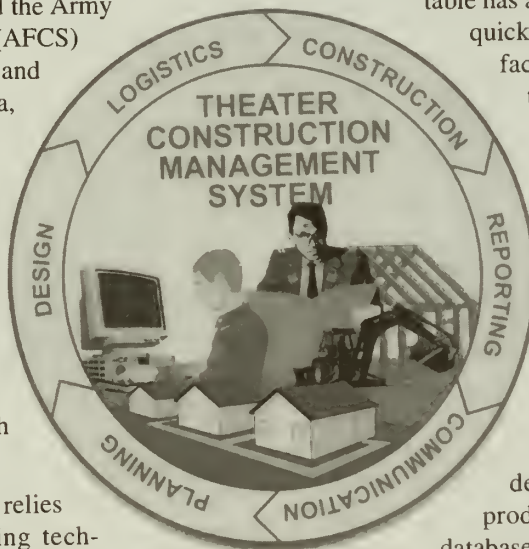
TCMS interfaces seamlessly with the AFCS database and COTS software. There are tables that allow users to search or query the AFCS database. The "facility" table enables users to look up various facilities and view the bill of materials (BOM), labor, or drawings associated with that facility. (Note: TCMS uses the term "facility" to identify any item that serves a purpose and contains a construction sequence. This could be a warehouse, an administration building, hardstand, a 1-mile increment of road, 1,000 feet of fence line or runway, bomb

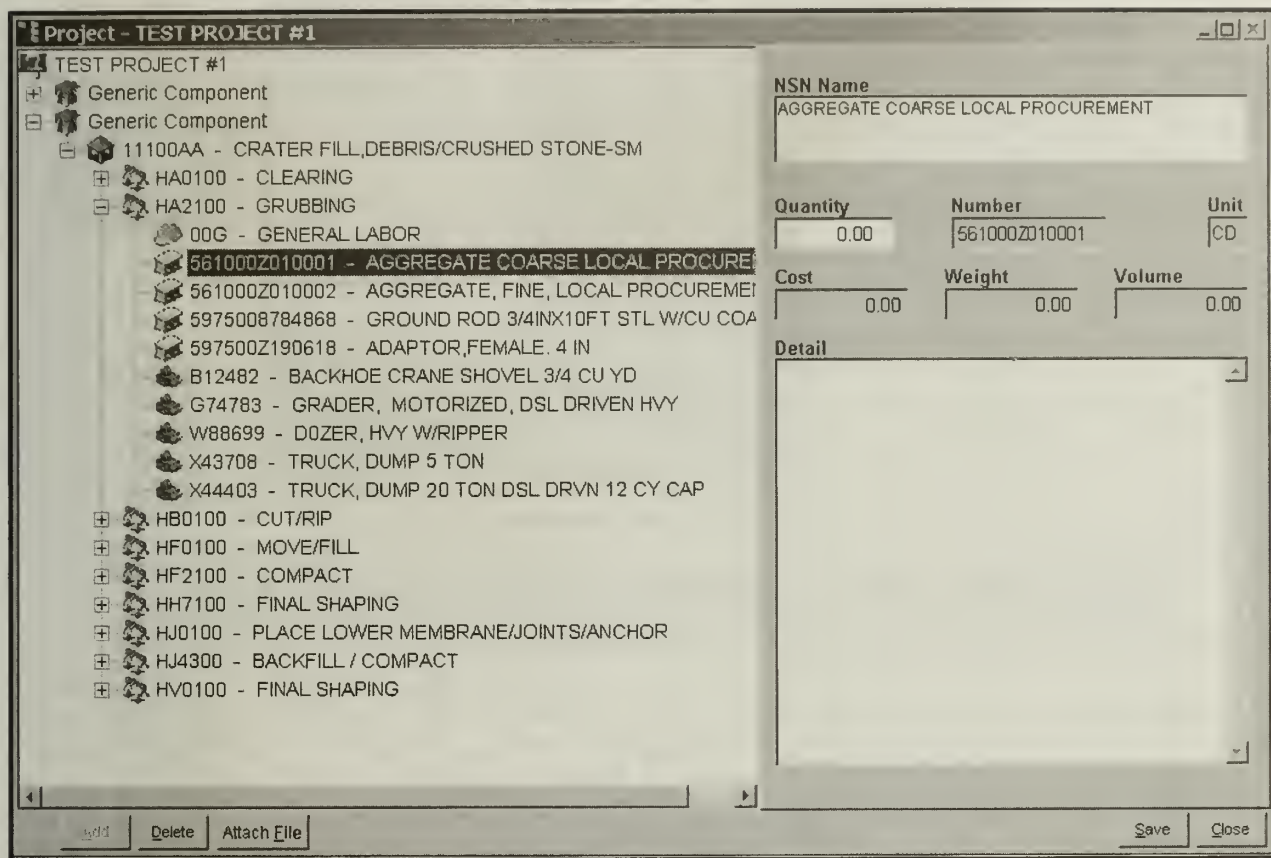
damage repair, a latrine, or a dining hall.) The facility table has a search filter that makes finding items quick and easy. There are more than 4,700 facilities in TCMS, including initial or temporary construction standards, various types of construction materials, and different climates and terrain. Vertical and horizontal construction are represented in the extensive database. The drawing table accesses more than 2,000 AutoCAD drawings which, when drawn into a computer-aided design (CAD) program, allows users to adapt a standard drawing to the site or situation. Items such as truss plate detail, material takeoffs, and detailed production drawings are included in the database. This resource alone gives users a leg

up on construction planning and execution. The program views CAD drawings with an internal viewer, letting users view and print drawings without leaving the TCMS environment. TCMS also allows the transfer of data mined from AFCS to Microsoft Project in logical sequences. This transfer of data in construction sequence, along with the import of user-defined resources, gives a decent Gantt chart without much of the stubby-pencil entry normally associated with developing such charts.

The AFCS database is the digitized information from Technical Manual (TM) 5-301, *AFCS Planning*; TM 5-302, *AFCS Design*; and TM 5-303, *AFCS Logistics Data and Bills of Materials*. These TMs were called the "Red Book" because of the red bindings encasing the standard drawing sheets. It took a footlocker to carry the TMs on a deployment, and it was a labor-intensive task to update and maintain them. They gave users information in the form of BOMs and labor for the facility, as well as drawings. The annual distribution of the TCMS replaced the publishing of the Red Books, and the Internet allows users to periodically update TCMS at <http://www.tcms.net>. This sometimes eliminates the need to mail new CD-ROMs. The Web site is also the place to go for technical information, program updates, training requests, and general TCMS information.

Changing TCMS meant thinking outside the box for the development team. Each part (programming, data, and drawings) could not be changed separately; each would



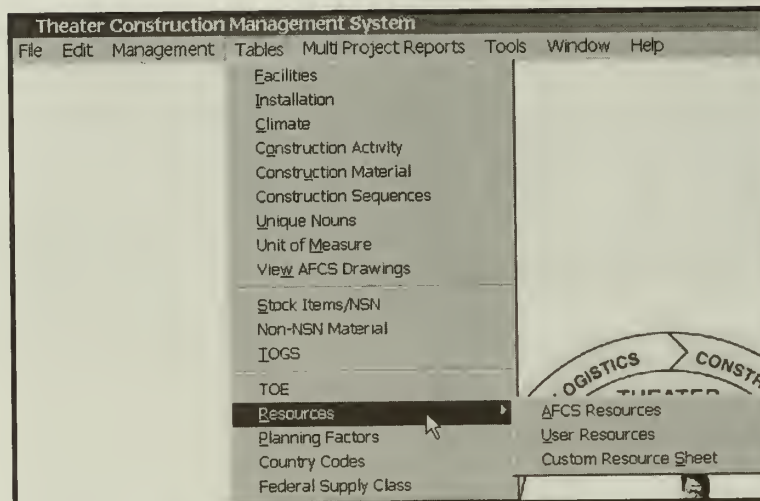


Sample Project Screen Shot

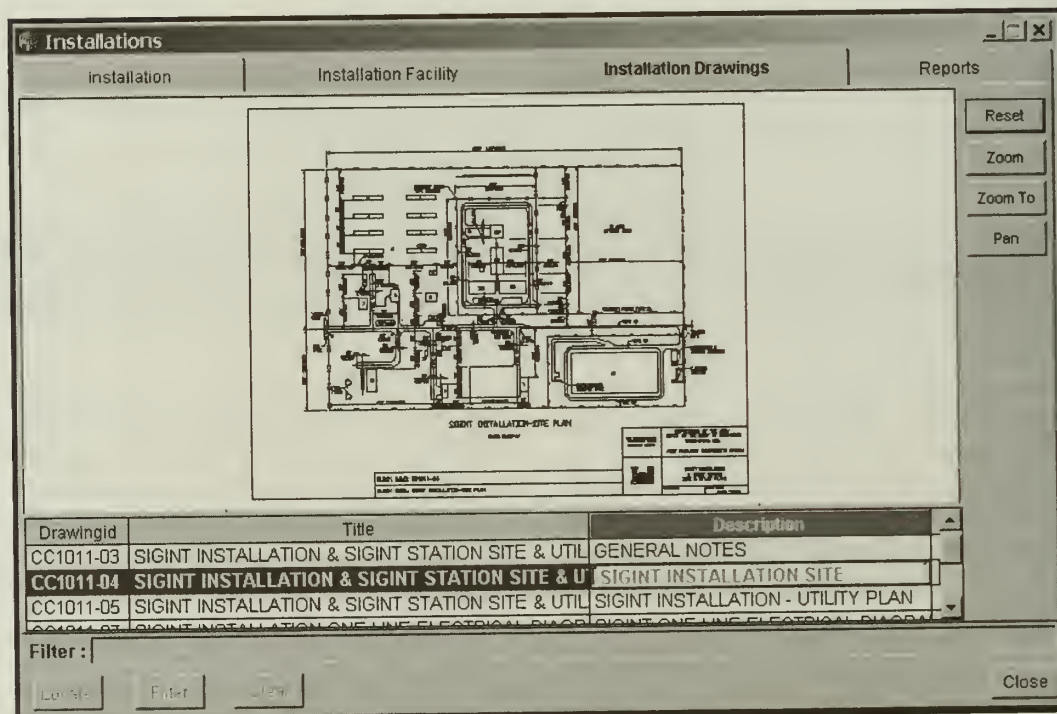
happen simultaneously. The tough part was not knowing if everything would work when all the parts were put together. The programming was updated to Visual FoxPro®. This was a major adjustment because 32-bit programming language allowed the arcane keystrokes method of version 1.2E to be supplanted by "point-and-click" commands. The programming also changed the way projects are viewed, using a graphic tree structure and icons. Seeing the relationships among component, facility, construction sequence, BOM, and labor allows users to make "drag-and-drop" project edits, as well as quantity changes, without losing sight of the overall project. Having multiple windows or tables open at the same time no longer locks the system. Using 32-bit programming ensures the life cycle of TCMS for years to come and allows it to interface with other 32-bit COTS software, giving the user access to the productivity gains associated with COTS. As the programming of TCMS/AFCS was being changed, the data structure of a facility was changed from the subfacility format to sequence. This change allowed the user to logically relate facility information. Each facility would now contain at least one construction sequence that would contain the labor to perform that sequence along with any materials that might be used during the sequence. For example, approximately seven construction sequences are used to build a warehouse. The drawing database expanded from 700 to more than 2,000 blocks, allowing the inclusion of production drawings and drawing details not previously available in TCMS. Including cross

sections of various road types, building footings, new campsite plans, Hesco® bastions, trusses, and other items, the database of drawings is a wealth of information. Combining all three changed elements created TCMS32, an engineering platform.

The engineering platform of TCMS32 allows the user to input local purchase materials by Federal Supply Code and country code. The user can input local labor resources and combine those into resource sheets for use in Microsoft Project. A feature that has limitless possibilities is the "attach file" function, which allows the user to attach any electronic file to the project. Now geographic information system (GIS) data, real estate data, contracts, after-action reviews, pictures, and any other file that can be found with Microsoft Internet Explorer can be archived within the project. Since a project is actually a TCMS32 ZIP file, those documents become a part of the project itself. Project labor production rates are adjustable, based on user input. The locally purchased materials list can be exported to other TCMS32 users, allowing the theater engineer to avoid bidding wars, inflated prices, and material shortages by using the same listing across an area of responsibility. Editing the locally purchased material listing for price, nomenclature, volume, and weight is quick and easy. The AFCS planning factors are now accessible in their own easy-to-find table. The biggest new feature is the "export" function under project reports. This allows the user to convert various BOM and labor project reports into Microsoft Excel, Microsoft Word, portable document format (PDF), or hypertext markup language



Screen Shot of Table Menu



Screen Shot of Internal CADD Viewer

(HTML). The project progress report and the project summary can also be converted to other file formats. This enables the user to send project information to other persons in formats they can use outside of TCMS32. Development is underway to add Web-based training and application execution.

Future additions to TCMS32 should include a custom design function, allowing the user to quickly create from scratch a new three-dimensional design in minutes, including BOM, labor, and production drawings. It will also allow the user to change construction material on the fly and automatically adjust the BOM and labor. The COTS software for this exists today. TCMS32 should have a GIS capability to site-adapt facilities; a heating, ventilation, and air-conditioning module to forecast heating and cooling designs for buildings;

and a module to address the power requirements for base camps and individual facilities. The ability to interface with current Army reporting systems and TeleEngineering will help engineers provide TCMS32 data across the battlefield. These items are part of the future development of TCMS32. The planning for TCMS64, a 64-bit version, will occur in fiscal year 2005. This will ensure that TCMS as an engineering platform will not be outdated by improvements in technology. With continued funding, these planned updates will become reality.

Mr. Boyd is a military planner with the AFCS branch of the USACE Engineering and Support Center at Huntsville, Alabama.



CTC Notes

National Training Center (NTC)

Changing the Environment at NTC

By Captain Timothy R. Vail

NTC has made significant additions to the contemporary operational environment (COE) in support of three recent stability operations and support operations (SOSO)-focused rotations. The most distinctive addition has been the creation of 12 villages across the desert.

Of the villages populated on the NTC battlespace, some are more prominent than others and, based on the scenario, some may be completely abandoned or thriving, based on economic conditions of the area. (Note: Village names may change with each rotation.) It is an ever-changing, growing, and realistic COE. The 11th Armored Cavalry Regiment (Opposing Force [OPFOR]) provides the civilians and paramilitary forces and, based on the unit and the training objectives of senior trainers, they can replicate any number of world regions, cultures, and religions.

Village Overview

- **Red Pass Ranch:** Formerly known as El Grazio, near Red Lake Pass—30 structures, an airfield, and 11 buildings recently added.
- **Eastland:** At the NTC east gate—19 structures, all recent additions.
- **Millersville:** Formerly known as Range 23—3 structures, no recent additions.
- **Silverlakes:** Formerly known as Range 24—4 structures, no recent additions.
- **Cave Springs:** Formerly known as Limaville—9 structures, no recent additions.
- **Citadel:** At the racetrack landmark—14 structures, all recent additions.
- **Tiefert City:** South of Hill 780 landmark—45 structures, all recent additions.
- **Junction City:** At the four-corners landmark—13 structures, all recent additions.
- **Langford Wells:** East of Langford Lake—19 structures, all recent additions.
- **Rockpile:** West of the Crash Hill landmark—13 structures, all recent additions.

- **Lakeside:** Formerly known as Nelson Lake Mining Camp—31 structures, an airfield, 5 buildings recently added.
- **Pioneer Valley:** Demilitarized communications complex—3 structures, to include an 81-foot-diameter communications dish.

Village Infrastructure

Each village contains varying levels of infrastructure, as discussed below. Through effective urban assessments leading to engineer support to the town infrastructure, the rotational units can win the support of the local populace.

- **Power:** Each village is outfitted with local generators for electricity. The buildings added most recently have 20-amp circuitry tied into the local generator supply.
- **Roads:** The larger villages of Tiefort City, Lakeside, Eastland, and Red Pass Ranch have received rotational unit support through gravel operations to reduce dust in the areas. However, roads remain generally unimproved.
- **Water:** Each village maintains local supplies of potable water with no local distribution networks.
- **Sewage/Waste:** Each village transports sewage and waste to Irwin Military City for treatment.
- **Drainage:** Nearly all road networks are susceptible to degradation due to heavy rainfall.
- **Structures:** There are four dominant styles of structures in the villages. Figure 1 depicts the locations and type of structures located at each of the villages. The annotations of A, F, B, and S correspond to the number of buildings that are formed, from 40-foot mobile buildings, preexisting facilities, railroad boxcars, and sheds, respectively. For examples of each, see Figure 2, page 62.

Engineer Support Makes a Difference

Figures 3 and 4, page 62, show the scope and size of two of the larger villages—Tiefert City and Lakeside. Within Tiefort

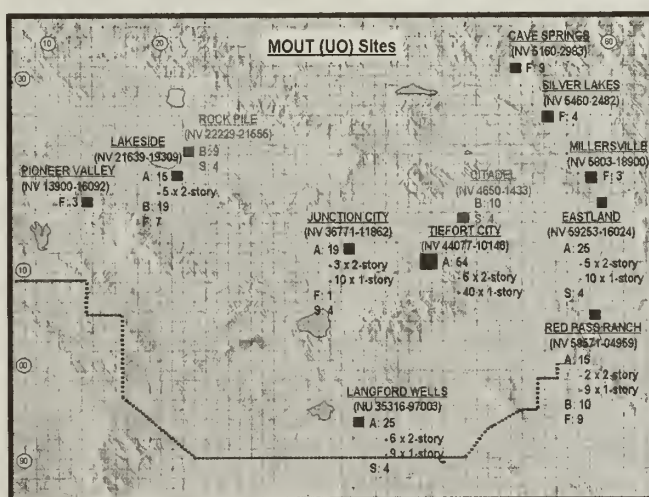


Figure 1. NTC Town Distribution

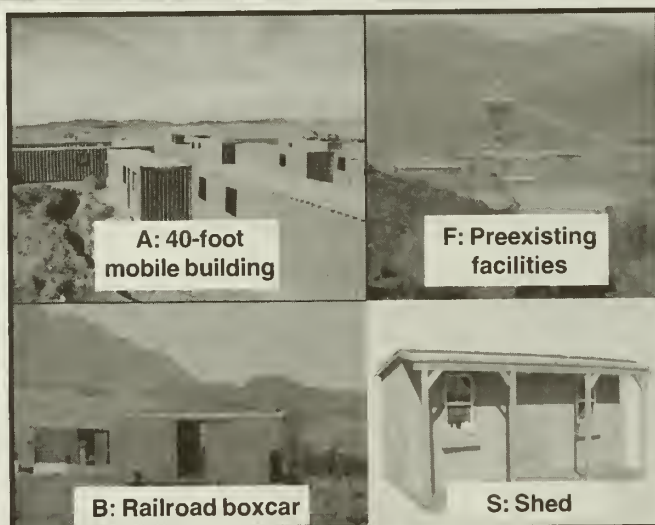


Figure 2. NTC Facilities



Figure 3. Tiefert City

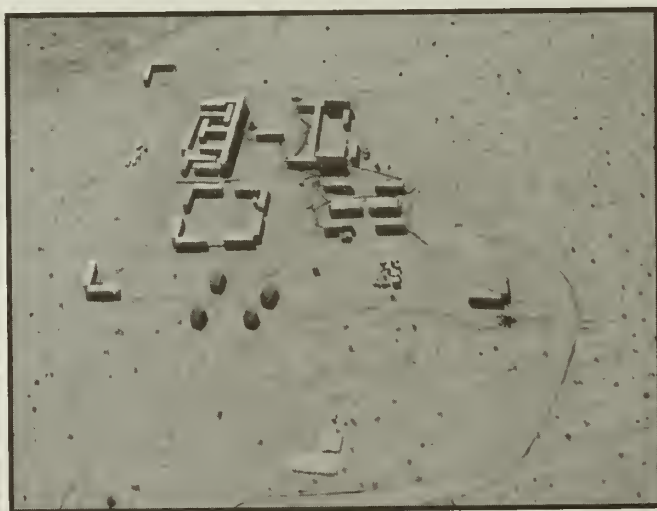


Figure 4. Lakeside

City, rotational engineer units have routinely improved roads and added buildings to support local economies and education. Tiefert City replicates the regional capital for the area, and long-term plans include continuous expansion of the town into a small city.

Lakeside has seen recent growth as well due to engineer effort, to include airfield improvements, dust control, and the construction of a schoolhouse. The framework of the local roadways is easily identifiable, and it continues to evolve as the town grows.

Conclusion

The COE at NTC continues to transform to meet the needs of the force. The addition of these villages to the battlespace and the adaptive nature of the 11th Armored Cavalry Regiment continue to ensure that units are prepared and ready for a wide variety of operational deployments.

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Emerging Threats at NTC

By Captain Mark R. Faria and Sergeant First Class Charles J. Maxwell

The Army has quickly transitioned from offensive operations to stability operations and support operations (SOSO) in current theaters of operation. This transition has brought new threats to our soldiers in the form of paramilitary forces and their weapon of choice—the improvised explosive device (IED). NTC has changed its training program to incorporate these new threats and train soldiers on conditions they will face in Iraq and Afghanistan.

Paramilitary Forces

Paramilitary forces normally operate from patrol bases in rural areas and are resupplied by a logistics network operating from Irwin Military City. Paramilitaries regularly visit NTC's villages to influence the populace as well as to get supplies. They store weapon caches in the rural areas but keep mortar caches very close to firing positions.

Paramilitary forces are very mobile, conducting combat operations 10 to 15 kilometers away from their bases using BRDMs (a Russian combat reconnaissance patrol vehicle), desert-colored high-mobility multipurpose wheeled vehicles (HMMWVs), and civilian vehicles for transport. Paramilitaries will drive unarmed through the areas of operation, link up with their logistics support at a predetermined location, secure their weapons, and then begin their combat operations. They have the ability to recruit from the urban center of Irwin Military City, as well as from civilians on the battlefield from towns in the area.

Paramilitaries are suspected of having three elements under centralized command and control (C2). Each element has



Paramilitary Camp

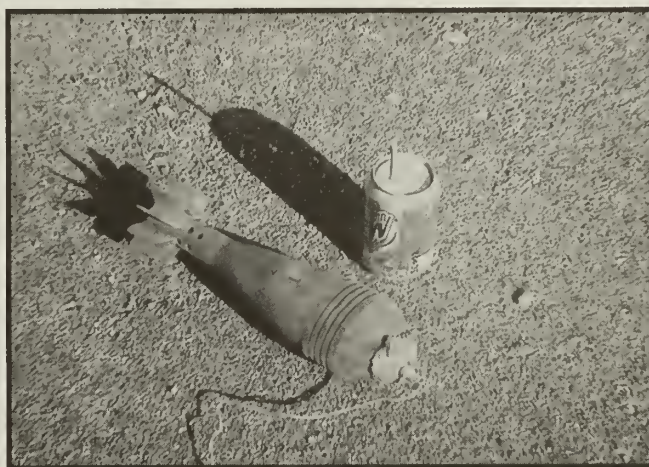
platoon-sized formations of 20 soldiers each. Centralized C2 provides additional mortars; intelligence, surveillance, and reconnaissance (ISR) assets; C2; and logistics support. Embedded within the platoons are terrorist cells that carry out suicide missions. Within each element, two platoons sleep during the day and conduct military operations at night, while one platoon conducts combat operations during the day and sleeps at night. Paramilitary forces, sometimes posing as civilians in civilian vehicles, maintain constant surveillance on U.S. forward operating bases (FOBs), looking for key systems and identifying patterns. Paramilitaries will target key systems such as logistics, C2, and collection assets. Some paramilitary tactics, techniques, and procedures (TTP) are to—

- Throw grenades and satchel charges, while posing as civilians.
- Fire 12 rounds of mortars, then displace.
- Fire mortars within minimum range of Q36/Q37 radars, preventing acquisition.
- Reconnoiter, identifying 8-digit grids for key systems such as tactical operations centers (TOCs), radars, and collection assets.
- Target logistics, C2, retransmission, and intelligence collectors.
- Assassinate pro-U.S. civilians.
- Use IEDs on main supply routes (MSRs).
- Conduct ambushes along MSRs and choke points, focusing fires on soft vehicles.
- Throw satchel charges from moving vehicles onto U.S. vehicles.
- Conduct suicide bombings on vehicles and personnel, normally one per day.
- Coordinate attacks on multiple FOBs, all taking place within 30 to 60 minutes of each other.
- Attack FOBs (10 to 12 paramilitaries); when casualties mount, single vehicles attack or 2 to 3 paramilitaries throw grenades.

Improvised Explosive Devices

In current theaters of operation, IEDs are becoming a weapon of choice. It is paramount that units develop TTP on how to deal with this hazard during training, rather than when they are faced with the real threat. NTC employs IEDs to achieve this objective.

Brigade combat teams (BCTs) face IEDs that are command-detonated in support of ambushes and attacks. They also face IEDs that are left to injure soldiers and civilians and instill terror among the populace. The ability to safely handle this threat greatly impacts the BCT's relationship with the civilians in their area as well as ensuring the force protection of their soldiers.



Typical IEDs at NTC

Paramilitary forces have used the following methods of IED emplacement:

- Roadside ambushes.
- Protecting weapons caches.
- Events that cause mass casualties and instill terror.
- Suicide bombers (vehicles, vests, and satchel charges) to kill U.S. forces.

To deal with the IED threat, units should—

- Analyze enemy ordnance order of battle (EOOB) to determine the types of threats.
- Plan for explosive ordnance disposal (EOD) response with dedicated security assets.
- Ensure that soldiers are trained on IED recognition, reporting procedures, and actions on contact.
- Analyze the complementary technical intelligence report (COMTECHREP) completed by EOD personnel to conduct pattern analysis and determine trends.
- Plot and track the IED threats on the battlefield and ensure that all units are aware of them.

Conclusion

NTC continues to transform in order to properly train BCTs on emerging real-world threats that our soldiers face in current theaters of operation. Paramilitary forces and IEDs continue to cause casualties in Iraq and Afghanistan; but by training these scenarios at NTC, units will deploy better prepared and have TTP on hand to counter these threats.

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Stability Operations and Support Operations

By Captain Christopher J. Tatka

NTC has recently conducted three rotations focused on stability operations and support operations (SOSO) in order to train units for deployments to support the Global War on Terrorism. This new NTC SOSO environment mirrors the areas of operation for potential deployments. Units operate out of forward operating bases (FOBs) and conduct operations in towns recently constructed in the NTC training area. This environment poses several challenges to the rotational units, which include—but are not limited to—paramilitary forces, civilians on the battlefield, and improvised explosive devices (IEDs). Typical missions where engineers support brigades in the SOSO environment are route clearance and cordon-and-search operations, force protection of FOBs, and general engineering.

Route Clearance

At NTC, units are not currently conducting route clearance as a combined arms operation, because engineer platoons serve as the support force, security force, and sweep force. As stated in Field Manual (FM) 3-34.2, *Combined Arms Breaching Operations*, route clearance is a "combined arms operation typically executed by an infantry company or cavalry troop." Task organizing for route clearance is similar to that required for breaching operations. Appendix E, FM 3-34.2 with Change 1, addresses in detail the planning and execution of route clearance operations. It discusses the clearance methods (linear, combat, and combat route), as well as the four sweep levels that should drive the brigade and battalion organization for route clearance operations.

Cordon and Search

The engineers' greatest contribution to cordon-and-search operations is the ability to use mine detectors in assisting with the search phase of the operation. In villages, paramilitary forces bury caches that may consist of weapons, ammunition, mines, and explosives. Engineer squads (divided into two search teams) are usually the unit of action (UA) to support the maneuver forces. When engineers use mine

detectors to search an area, the tempo of the search slows; however, a much more thorough search is conducted. Engineer elements must conduct rehearsals with their maneuver units in order to address concerns associated with the time it takes to conduct a thorough and complete search.

Two sweep teams are recommended, with one team leader and two soldiers per team. The recommended makeup and training of the teams is as follows:

- Four mine detectors (AN/PSS-12 Mine Detector or Handheld Standoff Mine-Detection System [HSTAMIDS]).
- Mine probes.
- Marking materials.
- Face shields.
- Mine detector calibration training.
- Mine detector techniques training (Safety of Use Message [SOUM] 02-001 for the AN/PSS-12 Mine Detector).

Force Protection of FOBs

Units conduct SOSO from an FOB that may or may not have existing force protection measures in place. These measures may include berms, survivability and fighting positions, triple-standard concertina fencing, or other protective obstacles. Engineer planners must recommend survivability and countermobility priorities to the brigade commander early in the planning process, based on their analysis of friendly engineer capabilities.

Examples of priorities for survivability and countermobility in and around FOBs include—

- C2 nodes.
- Q36/Q37/Sentinel radars.
- Indirect fire assets.
- Class III (B) supplies (fuels).
- Captured ammunition holding areas (CAHAs).
- Gates.
- Perimeter berms.
- Individual fighting positions with overhead covers.
- Ammunition holding areas (AHAs).

General Engineering

Engineer units are challenged by planning, controlling, and executing general engineering tasks. Engineer staffs that are trained in planning combat engineering operations have a difficult time transitioning into general engineering in support of SOSO. A suggested way of approaching the planning process is to plan general engineering as if planning for a defensive operation. The following tasks are critical:

- Identify village requirements.
- Know friendly capabilities (do not promise the world).

- Ensure that the engineer battlefield assessment (EBA) reflects friendly capabilities (including contractors).
- Pass the EBA down to subordinates to support.
- Allocate engineer forces (mass effort).
- Prioritize general engineering in the brigade combat team (BCT).
- Determine the best method to control assets (centralized versus decentralized).
- Develop and monitor the timeline.
- Check and confirm general engineering plan(s).
- Report progress (subordinates should keep the commander informed).

Before conducting general engineering support to villages, engineer battalions must establish a method of obtaining assessments they need in order to adequately plan the engineer effort. Current trends are as follows:

- Engineer battalions do not know what information they need or do not provide requirements to subordinate units conducting assessments.
- Units have no standard assessment method.
- Engineer units are not trained at conducting village assessments.
- Units do not know what tools and personnel are required to conduct the assessment.

Examples of information needed from village assessments are shown in the chart to the above right. This list could also include the following:

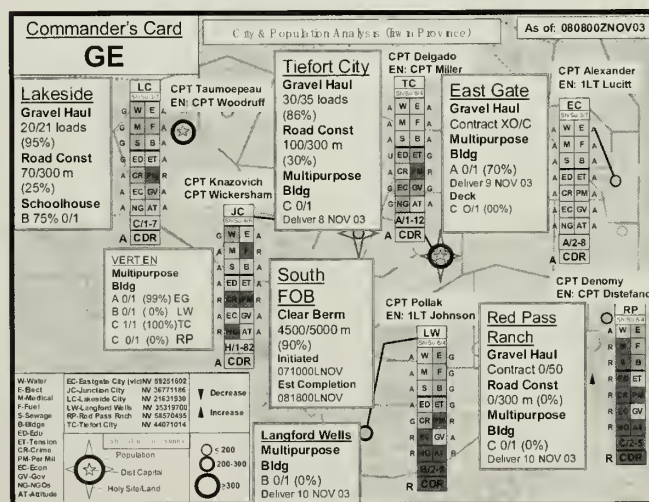
- Town diagram with structure numbering system.
- Required measurements in each category.
- List of tools and resources required to complete assessment.
- How to identify power generation.
- Waste disposal system.
- Engineer skills and capability of local population.
- Location of explosive hazards (unexploded ordnance [UXO], mines).
- Resources that could be used by U.S. forces (engineer equipment, materials, and tools on-site).

The finalized assessment should be placed in the engineer company/battalion tactical standard operating procedure (TACSOP).

Tracking the progress and managing assets to support general engineering can be challenging for a commander. The chart in the lower right column is an example of a commander's card that engineer battalion staffs can update every 12 to 24 hours, based on the current battle rhythm.

Village Assessment

A. Personnel	F. Transmission (Power)
Male _____	Type of line _____
Female _____	Length _____
Children _____	Fuel required _____
B. Assumptions	Distance from _____
Water _____	generator _____
Roads _____	G. Appliances needing fuel
Structures _____	Cooking _____
C. Water Requirements	Heating _____
Quantity of storage _____	Generator _____
Type of storage _____	Other _____
Truck-delivered _____	H. Roads
Well-delivered _____	Approximate length _____
Gravity-fed _____	Damaged roads _____
D. Power Assessment	Road cover type _____
Buildings with _____	I. Structures
Buildings without _____	Housing _____
Buildings need _____	Commercial _____
E. Generators	Need repair _____
3-kilowatt _____	J. Types of repair
5-kilowatt _____	Roof _____
10-kilowatt _____	Structural _____
Other _____	Doors _____
	Windows _____
	Porches _____
	Fences _____



Commander's Card

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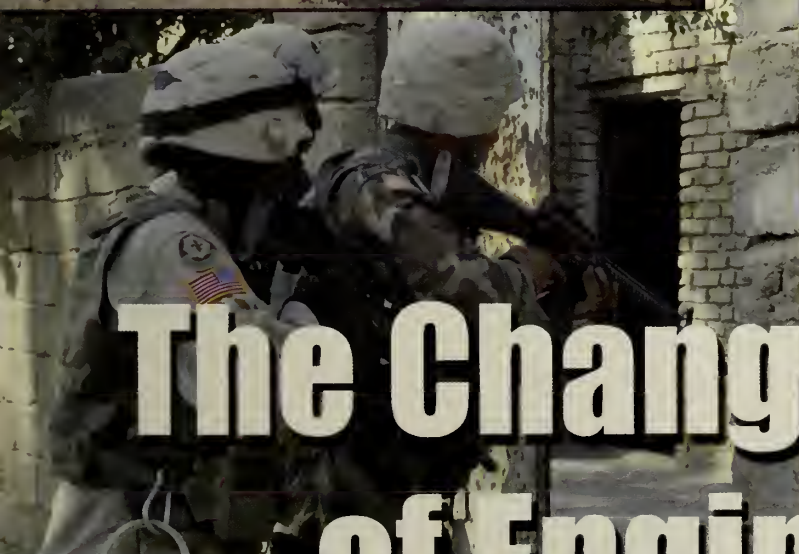


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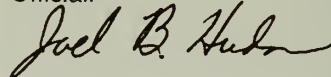
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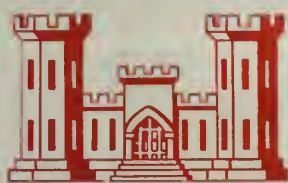
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Clear The Way

By Major General R.L. Van Antwerp
Commandant, U.S. Army Engineer School



I can't tell you how much we enjoyed having you at ENFORCE this year. From my view, there was an excellent exchange of ideas and a hearty celebration of our Regiment and the accomplishments of our sappers and engineers. We were blessed because you came, and we're already looking forward to next year!

Approximately 500 senior leaders attended the conference—leaders from active duty, reserve, and National Guard; the Army Corps of Engineers; civilians from the Army Corps of Engineers; retired civilians and general officers; and engineer representatives from industry. Engineers from the Air Force, Navy, and Marine Corps all sent senior leaders, and delegates from Germany, France, Australia, Canada, and Great Britain attended as well. A big thank-you to all who did the heavy lifting and made it special.

We were honored to have a wide variety of speakers at the conference: General Kevin Byrnes, Commanding General of TRADOC; Lieutenant General Bob Flowers, our Chief; Major General Richard Wightman, Joint Warfighting Center, U.S. Joint Forces Command Deputy Commander; Major General David Melcher, Director of Program Analysis and Evaluation Directorate of the Deputy Chief of Staff, G8; Major General Ron Johnson, Commanding General, U.S. Deputy to the Program Management Office, Coalition Provisional Authority in Baghdad, Iraq; Colonels John Peabody and Gregg Martin and a great international panel of Colonel John W. Shanahan OBE, United Kingdom; Captain William C. McKerrall, U.S. Navy; Colonel Bill Sowry, Australia; Lieutenant Colonel Anthony Funkhouser, U.S. Army; and Major Keith Cameron, Canada.

The Regiment focused on how our Future Engineer Force will be designed to support joint and multinational operations. We were able to pull together the senior leadership and take a close look at how the Engineer Regiment needs to change to meet the structure of the Army of the future. The conference



breakout sessions were a great success in giving our developments folks the input they need from the field to plan the Future Engineer Force structure as a modular force. During the multinational operations breakout session, foreign-service delegates discussed common problems and concerns and proposed solutions. They also talked about engineer equipment and capabilities.

At ENFORCE we set the stage to move toward a jointly trained and equipped engineer force capable of organizing and deploying to any area of operations and employing separately or as a joint force in support of the combatant commander. We need to become more efficient. We can all

benefit from financial savings if we purchase equipment together or use one contractor or supplier. We are exploring ideas to find a way for the branches of service to work together better, even to the point of proposing an engineer joint training center. Ideally, we want a force that is made up of four services that are trained alike, equipped alike, and capable of supporting the warfighter in whatever way he needs.

As this also becomes my farewell article, I challenge you to continue this transformation and rebuilding that we've begun. Much of what we're learning has been paid for by the sweat and blood of engineer soldiers. There have been times when the "book solution" didn't always work, but innovative and adaptive engineers found a way to get it done right anyway. Much of that was captured at ENFORCE and will be analyzed through the Center for Army Lessons Learned.

As we remembered our fallen comrades in the historic World War II chapel next to our memorial grove, I thought of the great legacy we have and the sacrifices that have been made in our ranks. We owe it to them to do our very best for them and for our Army. Our Regiment is strong because they—and you—make it so. The sapper spirit is alive and well. Essayons!

First Lieutenant Doyle Hufstедler
Specialist Sean Mitchell
Specialist Michael Karr
Private First Class Cleston Raney
Private Brandon Davis
Specialist Richard Trevithick
Sergeant Brian Wood
Staff Sergeant Abraham Penamedina
Specialist Isaac Nieves
Staff Sergeant Oscar Vargas-Medina
Specialist Ramon Ojeda
Specialist Ervin Caradine

1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
1st Engineer Battalion, Fort Riley, Kansas
9th Engineer Battalion, Schweinfurt, Germany
9th Engineer Battalion, Schweinfurt, Germany
20th Engineer Battalion, Fort Hood, Texas
82d Engineer Battalion, Bamberg, Germany
84th Engineer Battalion, Schofield Barracks, Hawaii
84th Engineer Battalion, Schofield Barracks, Hawaii
91st Engineer Battalion, Fort Hood, Texas

Private Jeremy Drexler
Private First Class William Strange
Specialist Kyle Bnnlee
Specialist Christopher Gelineau
Specialist Philip Brown
Specialist James Holmes
Specialist Dennis Morgan
Sergeant Cory Brooks
Private First Class Thomas Caughman
Specialist Doron Chan
Private First Class James Parker
Private First Class Bert Hoyer

91st Engineer Battalion, Fort Hood, Texas
91st Engineer Battalion, Fort Hood, Texas
120th Engineer Battalion, Pryor, Oklahoma
133d Engineer Battalion, Gardiner, Maine
141st Engineer Battalion, Jamestown, North Dakota
141st Engineer Battalion, Hettinger, North Dakota
153d Engineer Battalion, Winner, South Dakota
153d Engineer Battalion, Winner, South Dakota
391st Engineer Battalion, Spartanburg, South Carolina
411th Engineer Brigade, Windsor, New York
588th Engineer Battalion, Fort Hood, Texas
652d Engineer Company, Ellsworth, Wisconsin

Lead The Way



By Command Sergeant Major Clinton J. Pearson
U.S. Army Engineer School

I would like to take this opportunity to thank the command team of the 1st Engineer Brigade for their efforts in making ENFORCE 2004 the success that it was. Under the leadership of Colonel Paul Kelly and Command Sergeant Major Gerald Jones, the soldiers and civilians of the brigade showed their dedication to the mission by working tirelessly throughout the weeks leading up to and during the conference. And thanks to the Army Engineer Association (AEA) for its hours of support throughout the week. A special thanks goes to Mrs. Nancy Gregory and her team in our Executive Services Office for their work. Thanks for all you continue to do for our great Regiment and for making ENFORCE 2004 such a success.



Among the many events that took place during ENFORCE was the annual Council of Command Sergeants Major. It was great to see so many representatives from across the Regiment. Briefings ranged from Command Sergeant Major Michael Cline (5th Engineer Battalion) and Command Sergeant Major Greg Glen (555th Engineer Group) speaking on lessons learned from Operations Enduring Freedom and Iraqi Freedom, to Master Sergeant Sean Conner (Sapper Leader Course Non-commissioned Officer in Charge) giving a course update, to Master Sergeant Michael Bergeron and Staff Sergeant Richard Cook briefing on mine/countermine and the Mine Dog Section.

In concert with our ENFORCE theme, *Forging our Future - Shaping Engineers for Joint and Multinational Operations*, we were fortunate to have briefers from our sister services. Master Sergeant Frank Miller (U.S. Marine Corps), Master Chief Thomas Babb (U.S. Navy), and Chief Master Sergeant Steven Fraher (U.S. Air Force) provided updates that will bridge the gap between engineer capabilities in all services as our armed forces move into a new era of joint operations.

One of the most debated briefings came from Lieutenant Colonel Bryan Watson. It drew a mixture of support and dissent when he spoke on the Future Engineer Force, based on the White Paper on that subject. It is my sincere hope that we left this briefing with a better understanding that the Regiment must change now to support the combatant commander. The White Paper, which articulates our vision for the Future Engineer Force, is consistent with the Army's transformation to a joint and expeditionary force.

Activities the rest of the week included the AEA Golf Scramble and the annual AEA luncheon. Honored guests at

the luncheon were Major General Jack Waggener (Retired) and Command Sergeant Major Jack Butler (Retired), our outgoing Honorary Colonel and Command Sergeant Major of the Regiment. Receiving their charge as the incoming Honorary Colonel and Command Sergeant Major were Major General Pat Stevens (Retired) and Command Sergeant Major LeRoy Mello (Retired). Both were formally recognized at the 15th Engineer Regimental Dinner. We were fortunate to have Mr. Don Stivers, who unveiled his first-ever engineer print. Titled *The Command Team*, the print depicts the relationship between commander, command sergeant major, and their soldiers as they

prepare to cross the line of departure.

This year's Regimental Review/Regimental Muster featured a special tribute to Lieutenant General Robert B. Flowers, 50th Chief of Engineers. Unbeknown to General Flowers, when the adjutant gave the command "Officers and Colors, Post," the colors from all of General Flowers' previous units posted to the side of the reviewing stand. Also, during the "Pass and Review," General Flowers was joined on the reviewing stand by his wife Linda and honors were rendered to the entire Flowers family for all of their years of service, support, and dedication to the Engineer Regiment and the Army. They will surely be missed when he retires this summer.

The most explosive event was the Sapper Leader Course demonstration after the Regimental Run. We also introduced a "Best Sapper" competition that will be held at Fort Leonard Wood on 22-25 April 2005. Select and train your best sapper team for this new annual competition.

Among those honored at the Regimental Dinner were the recipients of this year's Regimental Awards. See page 30 for a list of the active duty, reserve, and National Guard winners. Congratulations to all of these outstanding sappers.

We took the time to honor our fallen sappers during a solemn memorial ceremony at the Engineer Memorial Grove. Lieutenant Colonel Tony Funkhouser and Command Sergeant Major Michael Cline, command team of the 5th Engineer Battalion, recited the names of all our engineer comrades who have given their lives in support of Operation Enduring Freedom and Operation Iraqi Freedom. This somber event served as a reminder that freedom isn't free. We are forever in their debt, and our thoughts and prayers are with the families of every soldier who has paid the ultimate sacrifice. We continue to pray for those soldiers who are deployed in harm's way.

Engineer Expeditionary Force Design Concepts— From Theory to Practice in Task Force Able

By Colonel Christopher J. Toomey

The Army is changing. Recent dramatic changes in the Army force structure toward a modular force impel the Engineer Regiment to change to stay relevant. We must continue to contribute on a battlefield that bears little resemblance to the linear, Cold War environment in which most of our engineer forces were structured to fight. Though we are busy fielding Stryker-equipped engineer companies in the Stryker brigade combat teams (SBCTs) and will develop companies as integral parts to the maneuver-based brigade units of action (UAs),¹ the bulk of our Regiment must adapt to the fundamentals of the future Army, (primarily at the unit of employment [UE] level) that call for tailored, scalable, modular, and responsive forces.²

Expeditionary Force Design Concept

The Regiment is exploring the engineer expeditionary force design concept as a force structure framework (Figure 1).³ At the tactical level, the concept proposes

combining engineer effects modules (EEMs)—building block elements with well-defined skills—with command and control (C2) elements into engineer mission teams (EMTs) that optimize engineer effects for a specific mission. The concept envisions a palette of EEMs that are dynamically task-organized into EMTs to fight discrete engineer engagements and then are reallocated by the engineer mission force (EMF), the headquarters that orchestrates and synchronizes their efforts, as the mission dictates.

It is a valid concept, but if it is exclusively tied to radical changes in engineer unit structure, it must overcome friction in the force development process. The long-term answer may be to make new, purpose-built engineer forces. However, a midterm solution is a mindset that engineer leaders can adopt today to employ engineer expeditionary concepts using current forces. The intellectual leap involves shedding the traditional parent organization and rigid logistical tail approach to employing engineer forces and turning available units into

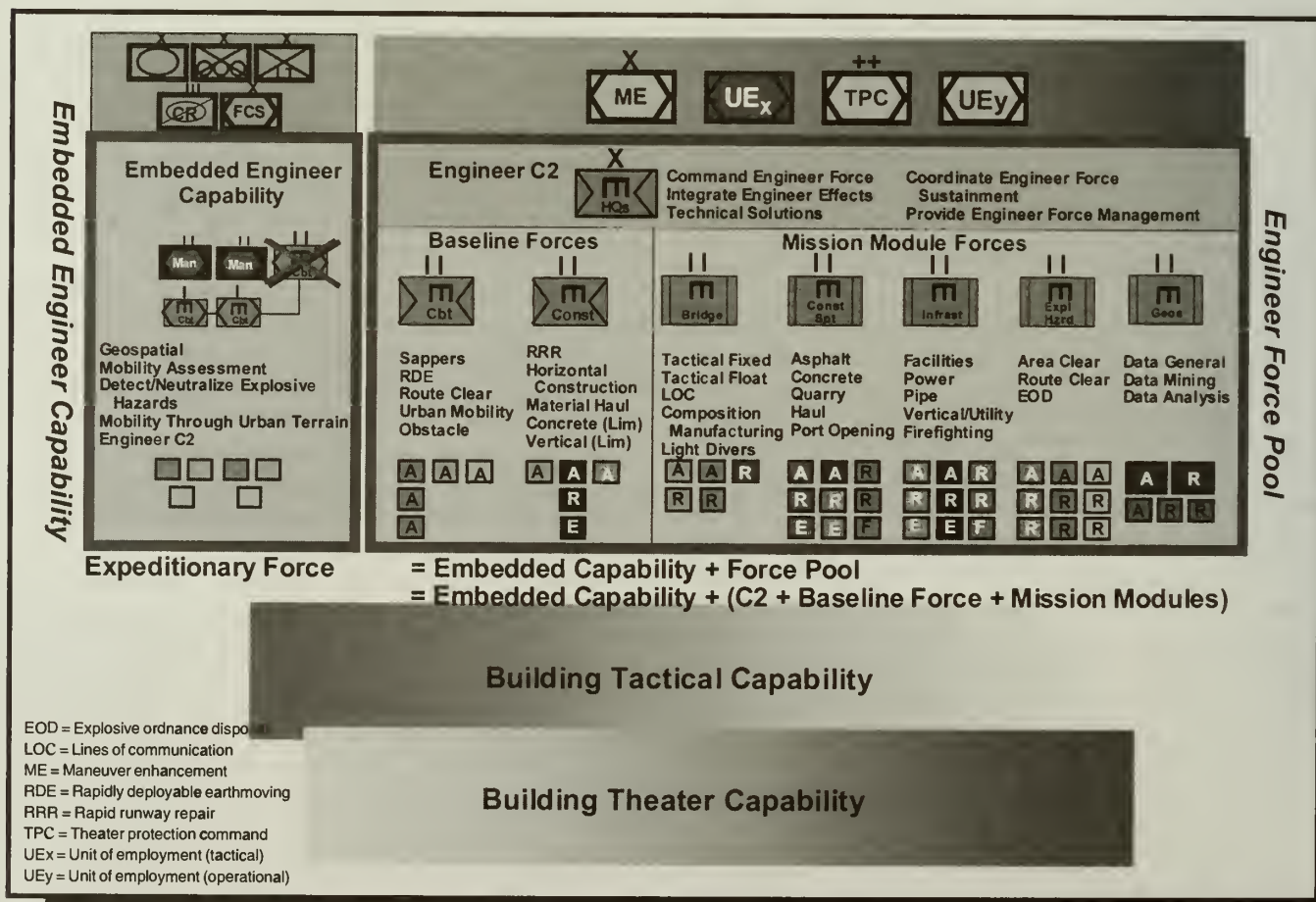


Figure 1. Future Engineer Force Framework

EEM packages that are combined into EMTs and used to fight specific engineer engagements.

During Operation Iraqi Freedom, the 555th Engineer Group led the multifunctional and multicomponent Task Force Able as an EMF integral in the 4th Infantry Division. It successfully employed engineer expeditionary concepts with traditionally organized combat and general engineering assets to execute combat missions that not only enhanced the versatility and agility of Task Force Able but increased its ability to contribute to the division's fight.

Starting in July 2003, Task Force Able aligned its forces to create a menu of C2, sapper, vertical and horizontal construction, bridge emplacement, and logistical EEMs that were rapidly combined under C2 nodes to fight specific engineer engagements and then disengaged as the mission set changed. This required adopting a revised mental map of engineer forces that transformed traditional organizations into EEMs and EMTs. For example, rather than looking at a combat heavy battalion as three combat heavy companies with a headquarters, Task Force Able created a mental map of this unit as a battalion-level C2 node, company-level EMT C2 nodes, and vertical and horizontal EEMs (Figure 2). Other units were viewed similarly. A corps wheeled company was mapped to consist of an EMT C2 node, three sapper EEMs, and a horizontal construction EEM. Though EEMs execute specific skills, early on it was deemed impractical to make them smaller

than platoons, given the nature of combat operations, force protection requirements, and the need for small-unit cohesion.

From Theory to Practice

Building the Haight-Jordan Bridge

Named for two 14th Engineer Battalion soldiers who died in Operation Iraqi Freedom, the Haight-Jordan Bridge is a Mabey-Johnson float bridge, more than 300 meters long, across the Tigris River, south of Tikrit. Building the bridge included developing a connecting road network and significant road construction, as well as initiating force protection measures and field fortifications during and after construction. To accomplish this mission, Task Force Able employed engineer expeditionary concepts. A company-level C2 node was assigned the following EEMs: a horizontal construction module for earthmoving, a bridge module for bridge erection, and a combat engineer module for security and force protection. None of these units came from the same company or battalion, but represented the diversity of Task Force Able, with units from all Army components—active, reserve, and National Guard. The result was the seamless integration of all forces and a successfully executed mission. Of particular note was the C2 node that was in fact a corps wheeled company headquarters. Its task was to integrate and orchestrate the technical modules to accomplish the mission.

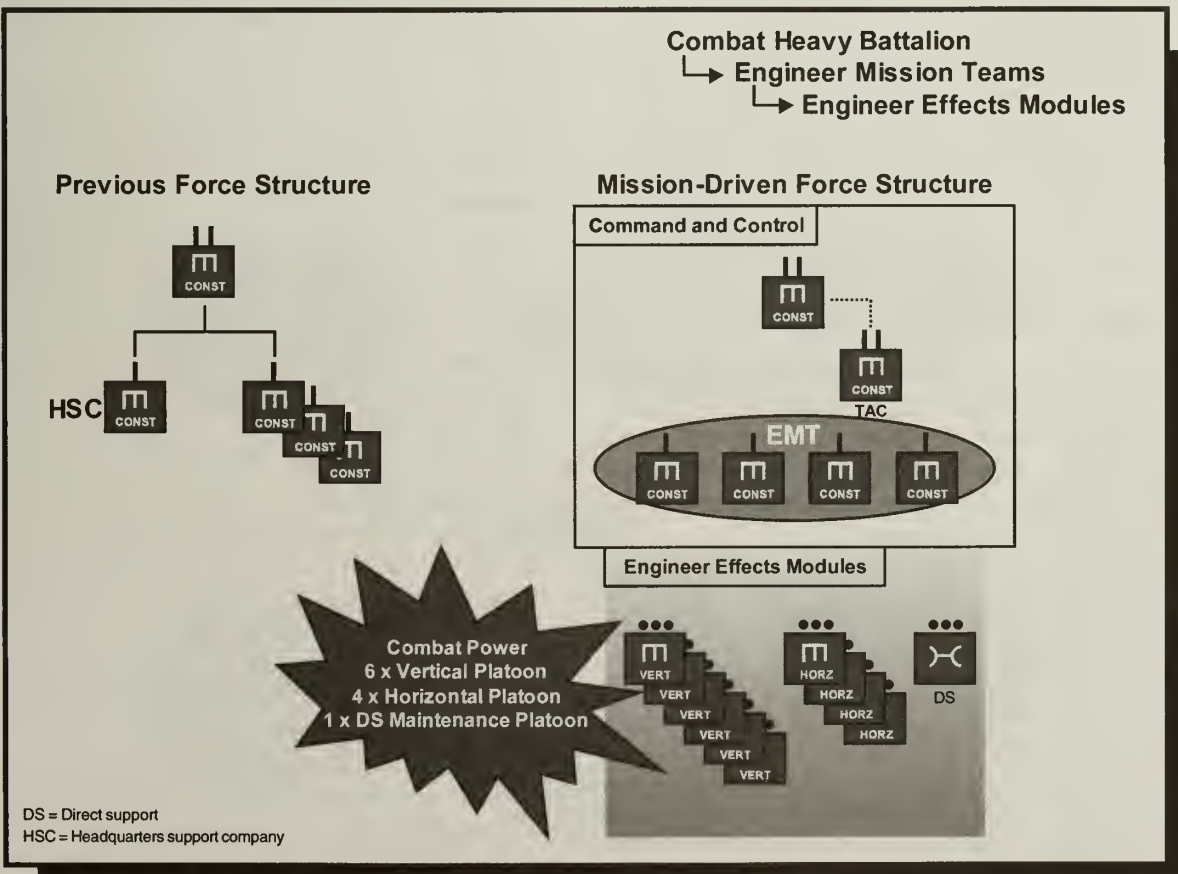


Figure 2. Mental Mapping Expeditionary Concept



Task Force Able built the Haight-Jordan Bridge across the Tigris River, south of Tikrit.

Forming Task Force Trailblazer

Combating improvised explosive devices (IEDs) along key routes within the 4th Infantry Division's area of operations made it necessary to form Task Force Trailblazer. Established around a battalion headquarters as a lieutenant colonel-level EMT C2 node, Task Force Trailblazer was formed with company EMT C2 nodes controlling mission-oriented surveillance, security, and obstacle reduction modules from multiple organizations. The C2 nodes used the modules in a plug-and-play mode that optimized their capabilities. Construction equipment platoons coordinated with sapper platoons to clear and grub roadway shoulders and medians to eliminate IEDs and discourage future emplacement. Surveillance and security modules were integrated to provide oversight and protection along the routes during clearance operations and counter-IED ambushes. The end state was fully optimized clearance packages that could be moved easily about the battlefield to respond to changing threats.

Lessons Learned—Keys to Success

Task Force Able gained early lessons learned from incorporating engineer expeditionary concepts with current engineer forces. As the task force reflects on its role in Operation Iraqi Freedom and prepares for future operations, it will continue to revise and assess these lessons.

Creating Multifunctional EMT C2 Nodes

Battalion and company leaders conducting operations with Task Force Able freed themselves from traditional, unit-specific jurisdictions. A bridge company headquarters was expected to serve not only as an EMT for bridging operations but also as an EMT C2 node for nearly any engineer operation. This gave the task force commander greater flexibility since any company could provide the C2 necessary for an EMT and, given the appropriate EEMs, complete any engineer mission. The commander could rapidly task-organize around assets that either were not engaged or were near the mission location. This became critical on a dispersed and dynamic battlefield

and required great agility on the part of the company-level leaders, who had to transform from engineering specialists to engineering generalists. Clearly, this application required a touch of reality: a combat heavy EMT C2 node was best for a construction engineer mission. Yet, multiple missions were accomplished with EMT C2 nodes going "against type" in directing a variety of EEMs.

Building Flexible EEMs

Battalions and companies were charged with developing truly plug-and-play EEMs from their platoons. This developed over time, and success varied among units.

- Units must tailor their logistics and free their units from logistical constraints. The task force and subordinate battalions became adept at providing combat service support to a variety of EEMs, and moving logistical EEMs became routine. Maintenance was the toughest area to resolve. Units profited from an understanding of the maintenance requirements of all EEMs. Task Force Able relieved maintenance shortfalls by aggressive use of mobile maintenance teams and the development of transferable, EEM-specific prescribed load lists (PLLs) that could accompany units.
- Units must ensure that communications and standard operating procedures (SOPs) are compatible, consistent, and streamlined. Faced with a multicomponent force, Task Force Able had to reallocate communications assets and work hard to develop consistent SOPs and protocols that helped ensure continuity across the task force. There were hiccups, but over time an EEM from one battalion could easily work with an EEM from another battalion as part of an EMT.
- Units must establish protocols to rapidly integrate EEMs into EMTs, with the burden placed on the EMT C2 node. These bonding techniques, based on enhanced leader battlefield circulation and staff focus on integration, placed incredible demands on the unit leadership.

(Continued on page 11)

Preparing the Engineer Brigade for Operation Iraqi Freedom

By Colonel Don C. Young

"Engineers are everywhere! No matter where I go in Baghdad, I see engineers hard at work, doing a wide variety of missions."

—Brigadier General Martin Dempsey
Commander, 1st Armored Division
16 July 2003

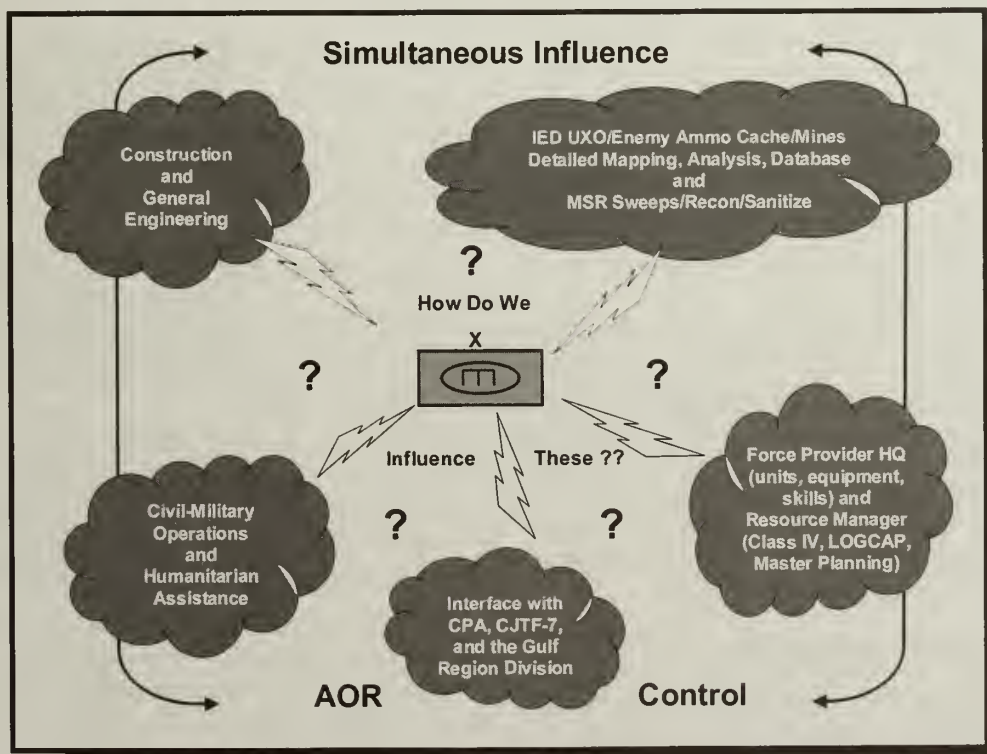
How does a unit prepare for stability operations and support operations (SOSO) missions with high-intensity conflict operations occurring daily? This article incorporates the initial lessons learned from the 1st Armored Division (1AD) Engineer Brigade operations in Baghdad and recent observer-controller trends used to prepare an engineer brigade headquarters during a division command post (CP) exercise for a follow-on Operation Iraqi Freedom-designated deployment. The article focuses on three key themes: mission areas, CP operations, and predeployment training.

Mission Areas

The figure below outlines the five baseline mission areas that an engineer brigade (or division engineer in the case of a light division) must influence for the mission success of the division. Some may classify them as "glass balls," but I would rather treat them as mission-essential task

list items. This enables the engineer brigade and subordinate units such as sapper battalions and assigned echelon-above-division (EAD)/echelon-above-corps (EAC) units to conduct further mission analysis to identify the battle tasks required for engineers at all levels. These battle tasks and their information management requirements will drive the structure, operations, and systems of the engineer brigade CPs: engineer main (EMAIN), assistant division engineer (ADE), engineer tactical action center (ETAC), and engineer rear (EREAR). Once engineer leaders understand the missions of the Operation Iraqi Freedom theater and how to run the engineer CPs, they can focus the predeployment training program on the essential individual and collective tasks required for mission success.

The engineer brigade must configure itself to handle simultaneously the role of the five mission areas. Each one must be treated separately with fully assigned assets for command and control responsibility. A construction



Baseline Mission Areas That Engineers Must Influence

management section (CMS) is an absolute necessity, whether augmented from a combat or construction engineer group or combat heavy battalion headquarters or fielded "out of hide" with school-trained engineer officers and senior non-commissioned officers assigned to the brigade headquarters. Also, the use of liaison officer augmentation at key locations will enhance situational awareness and parallel planning. In our case, the EMAIN often was able to inform the division main CP about engineer missions about to be assigned to the division from Coalition Joint Task Force-7 (CJTF-7)/Coalition Provisional Authority (CPA) because of the highly effective use of liaison officers. Another area of interest is contract construction completed by many different programs and "colors" of money. The key to success is the ability to access, track, and influence the division priorities with construction contracting capabilities within the commanders' discretionary funds, civil affairs, the CPA, and the Gulf Region Division.

The engineer brigade civil affairs officer (S5) pays big dividends for the EMAIN. The S5's interaction with the Assistant Chief of Staff, G5 (Civil Affairs); the division Civil-Military Operations Center (CMOC); and civil affairs units will help identify and obtain construction contracts and hard-to-get Class IV supplies. In some cases, sapper battalions are attached to their brigade combat team (BCT) headquarters. Even under this type of command and support relationship, the force provider role of supplying trained and ready forces never ends for the division engineer. Therefore, the engineer brigade commander (or division engineer) retains the essential responsibilities for maintaining engineer equipment, supplying force protection barrier material, and providing construction and additional sapper capabilities. A key element to success is sapper battalion reporting (dual chains of command) and functional area stovepipe requirements that must remain in effect to maximize engineer support across the entire division sector. The Assistant Division Commander (Support); the Division Support Command (DISCOM); and the Assistant Chief of Staff, G4 (Logistics), will also look to the engineer brigade for expertise and leadership on base camp master planning, Logistics Civil Augmentation Program (LOGCAP) contract interface, facility preparation work, and priorities for Class IV transport and issue.

One last area that the engineer brigade must take the lead on is improvised explosive device (IED) database tracking; predictive analysis; and tactics, techniques, and procedures (TTP) trend identification through coordination with explosive ordnance disposal (EOD) units, the Assistant Chief of Staff, G2 (Intelligence), the analysis and control element (ACE), and the BCT engineers. The brigade intelligence officer with All-Source Analysis System-Light capability in the EMAIN provides IED expertise throughout the division.

CP Operations

The basic layout of the engineer CPs must be structured to handle the full spectrum of combat operations. Our crossing force headquarters configuration for the

EMAIN facilitated the CP expansion for this deployment. Force modernization will include the usual problems of transitioning from analog to digital systems, coupled with the challenges of transitioning CPs from high-intensity conflict to SOSO missions. Information management is the key system for ensuring success by enabling the commander to "see himself." Identifying the critical information requirements is essential to streamlining the wide variety of data that comes into a CP daily and then deciding what to do with it. One way to achieve this objective is to establish a common operational picture (COP) that aligns and synchronizes all four engineer CPs, especially for informing the division command group. It can include digital maps, but map images alone will not help the division engineer to influence the division fight. One invaluable option is the "brigade snapshot" (shown in the table on page 9). This one-page document enables the brigade commander and subordinate commanders to see themselves and to quickly outline problem areas. It drives the information management process, to include critical collection efforts. Coupled with the rolling battlefield update briefing slides and current missions on sector maps, the four engineer brigade CPs remain synchronized and focused with the same engineer COP.

Predeployment Training

Units will struggle with the mandatory Coalition Forces Land Component Command (CFLCC) and major command training requirements to be accomplished before deployment and those required during reception, staging, onward-movement, and integration (RSOI). Based on our experience in Baghdad, leaders should focus on the following "Big 8" areas of predeployment training for all engineer units:

Weapons Familiarization

Every soldier is a rifleman first. Help your soldiers become comfortable with their weapons. Go to the range as often as possible and practice reflexive fire techniques, both mounted and dismounted. Like it or not, engineers are performing a lot of infantry tasks in Iraq.

Convoy Live-Fire Training

Soldiers must be accustomed to firing their weapons while mounted. This should be practiced before entering the theater. Scenarios can include ambushes along obstructed routes, IED attacks, IED attacks followed by rocket-propelled grenade and small arms fire, attacks by single or multiple snipers, and mounted or dismounted suicide bombers. Each scenario contains a unique set of challenges and appropriate counterreactions.

Extra Crew-Served Weapons Gunner Qualification

There is always a shortage of qualified gunners for tactical movements and patrols. Double-qualify so you can continue the mission while allowing the crew to rest. Include squad automatic weapons in this effort.

Unit	EN BDE TAD TOC Grid	Date DNVIT	28 Jun 03 Call Sign	Time 1323	Location Maintenance	Iraq	Personnel Accountability Unit
493d EN GRP				Vehicle Type M113	Avail	O/H	Total Engineers 493d EN GRP
94th EN BN				M9 ACE			203d EN BN
389th EN BN				M548			94th EN BN
203d EN BN				AVLB			535 CSE
671st MRBC				MICLIC			842d CSE
1457th EN BN				SEE			249th EN DET
16th EN BN (TOC)				D7			389th EN BN
40th EN BN				D9			B142d EN
70th EN BN				Scrapers			H33B/141 SIG
439th EN BN				Graders			1457th EN BN
2LCR RENG				Cranes			759th EOD
ETAC				Loaders (MMW24C)			18th EOD
Last 24 Hours - Significant Events				Loaders (175B)			
Unit	What	Where	When	20-Ton Dumps			
				5-Ton Dumps			
				BEB			
				Paver			
				Excavator			
				Fire Trucks			
				Fork Lift 10k			
				Fork Lift 6k			
High-Visibility Priorities - 28 Jun				% Complete	ECD		
Unit	What			65	TBD		
493d	CJTF HQ Upgrades			15	TBD		
493d	Camp Cropper Upgrade			76			
40/493/1457	Zoo Opening Tasks			51	20 Jul		
493d	LSA Dogwood			90	13 Jun		
493d	Police Station Upgrades			12			
1457th	Police Station FP Upgrades			75	9 Jul		
1457th	BIAP FP Upgrades			20	TBD		
493d	LSA Dogwood Footbridge			Ongoing	TBD		
1457th	18DE, 3IDA SR Clearance			Ongoing	TBD		
493d	BIAP Master Planning			84	TBD		
1457th	Tunnel Recons			Awaiting BOM	TBD		
40th/1457th	14th of July Bridge			1	TBD		
493d	Prefab Showers for FOBs			5	31 Jun		
493d	PMP Replacement			15			
493d	LOGCAP Dining Facility			10	15 Jul		
493d	Support to Camp Victory			Where	When		
493d	Civilian Airport Opening Tasks			EMAIN	0700		
	Today's Meetings			1000			
Who	What			BIAP	1100		
Staff	Staff Update			Radio Show	1130		
CDR	501st COC			Construction/Utilities	1400		
S3 DPW	Mayor Cell MTG			1AD Conference Call	1700		
CDR	S3 CONSTR			USACEV Corps VTC	2000		
YO							

IED/Unexploded Ordnance

Ensure that every soldier has situational awareness, the ability to recognize a multitude of devices, an understanding of force protection measures, and the TTP for enemy employment.

Antiterrorism Training

The focus is on how to design secure forward operating bases. Engineers are expected to be the experts, but few have received any training on minimum standoff distances for various IEDs and how to effectively design and emplace protective measures against vehicle and suicide bomber attacks. Capitalize on the talents and resources of the Engineer Research and Development Center via TeleEngineering or other means, when appropriate.

Engineer and EOD Interaction

Clearly define the sapper role versus the EOD role for the various types of joint missions being performed in theater.

Use of Demolitions

Validate every sapper and engineer, regardless of military occupational specialty, on demolition procedures. They will definitely use them in Iraq. Include in this training the proper manner to safely destroy captured munitions without causing second-order hazards.

Physical Fitness

Emphasize upper-body strength and long-distance runs to provide the fitness needed to endure the heat and the tempo of operations.

Mission Success

The Big 8 will pay huge dividends for your unit as an enduring foundation for a year-long deployment. Additionally, leaders must oversee focused planning to establish systems within each engineer brigade CP and to complete required cross-leveling to handle daily requirements. Consider the following areas for ensuring mission success:

- Integration of EAD engineer units into the division (task-organized Active Component/Reserve Component assets) and mission planning for other EAD/EAC engineer assets conducting a short-term mission in the division sector.
- Use of division terrain teams in support of five BCTs (urban operation products) maximized.
- Role of the ADE in the division targeting effects process and operations and plans.
- Creation of a CMS (out of hide) for the EMAN. This must include battle-tracking techniques for contract construction and troop construction projects.
- Operation of the Class IV yard instead of leaving it to the DISCOM or main support battalion to run a division-level yard for force protection and construction materials.
- Maintenance support of construction equipment (beyond sapper unit modified table of organization and equipment

[MTOE]) and special engineer equipment in the sapper battalions.

- Security, repair, and upgrade of existing infrastructure (water, power, sewer, airports, zoos, and bridges).
- Assured mobility through bridge replacement planning and main supply route upgrades.
- Predictive analysis of IED and UXO use by the enemy.
- Use of the ETAC on CPA/ CJTF-7/division priority project sites.
- Command and control of MK2 bridge boats for river patrols.
- Request for information and force request process to the next higher engineer headquarters.
- Use of the up-armored D9 and mine-clearing armor-protected (MCAP) D7 dozers (TTP).
- Use of casualty tracking/reporting (doctrinal use, as well as use of alternative channels).
- Use of EREAR manning versus rear area engineer responsibilities.
- Best utilization of an assigned engineer group headquarters.
- Use of the corps wheeled battalion across the division sector.
- Use of patrol and tactical road march briefs and operations.
- Reaction to contact (mounted and dismounted, direct/indirect/ambush).
- Knowledge of unit basic loads and vehicle movement load plans.
- Utilization of contracting/field ordering officer/Class A agent.
- Security plans of every operation with internal engineer assets.
- Use of an engineer liaison element with the U.S. Army Corps of Engineers division, the CMOC, the CPA, and attached maneuver units (beyond the normal three BCTs).

Conclusion

The Engineer Regiment is fully engaged in the Iraq theater of operations. An example is shown in the photo on page 11. It depicts sappers from a Reserve Component EAD unit—the 1457th Engineer Battalion (Corps) (Wheeled), Utah Army National Guard, task-organized to the 1AD Engineer Brigade—working on a war-damaged suspension cable on the 14th of July Bridge, now called the Freedom Bridge. The repair design was done through reachback capability to the U.S. Army Engineer Research and Development Center at Vicksburg, Mississippi, via the brigade TeleEngineering Toolkit, while the BCT sappers provided security and logistical support to the EAD unit operating in their BCT sector. Materials to repair the bridge were fabricated by soldiers from the 1457th, who have extensive military and



Sappers work on a war-damaged suspension cable on the 14th of July Bridge, now called the Freedom Bridge.

civilian experience with such tasks. This is an important point to note as Reserve Component soldiers bring a wealth of expertise from their civilian professions and experiences. The heavy-gauge cable for the repair was obtained by the 1AD Engineer Brigade logistics officer through a local vendor. Initiative and resourcefulness by engineer leaders focused on logistics resources are paramount in missions of this nature.

The synchronization and resourcing of engineer operations from the sapper squad to the contracting support of infrastructure rebuilding in a division area of operations fall to the engineer brigade commander (or division engineer). The current engineer brigade MTOE and doctrine must be adapted for mission success in Iraq and future theaters of operation. Operation Desert Storm in Iraq, Operation Joint Endeavor in Bosnia, and Operation Iraqi Freedom clearly outline the need for, and added value of, having an engineer brigade organic to a heavy division. We must prepare our young engineer leaders for the challenge to make them flexible for future operations as our senior leaders on the ground. They are our future and are vital to ensuring that engineers remain as superb value-added to the combined arms team. Essayons! 

Colonel Young serves as executive officer to the deputy commanding general of U.S. Army, Europe. He was the commander of the 1AD Engineer Brigade from July 2001 to July 2003. The brigade tripled in size with the addition of EAD/EAC engineer units following the transfer of authority with Engineer Brigade, 3d Infantry Division, in Baghdad in May 2003. A graduate of the U.S. Army War College, he holds a bachelor's in civil engineering from Vanderbilt University and a master's in civil engineering from the Georgia Institute of Technology and is a certified professional engineer in Virginia.

(*"Force Design Concepts," continued from page 6*)

Training the Battle Staffs

It was essential to train Task Force Able's battle staffs to accommodate dynamic task organization to ensure that the EMTs were properly integrated and resourced. This required extensive training, and the task force developed an in-theater program—executed concurrently with combat operations—to train them. After-action reviews that focused on the application of EMF principles were essential. Units that train for a traditional, pretransformational, echelons-above-corps role were most challenged in retooling their battle staffs. However, all units made the transition.

Ensuring Cohesive Senior Leadership

Leadership at the task force and battalion levels was essential to the successful implementation of EMF concepts and the success of Task Force Able. Battalion leaders had to stop thinking in terms of "their" units, assume a broader task force identity, and become dedicated to ensuring that uniformly high Task Force Able standards were applied. All soldiers and junior leaders required coaching, counseling, and mentoring. It was a challenge to maintain unit identity, ensure that administrative actions were accomplished, and foster critical home station threads such as family readiness groups. Yet, a great result of employing EMF concepts was a more cohesive senior leadership that was extremely familiar with the breadth of task force operations.

Conclusion

As the Army moves to greater modular forces, the Engineer Regiment should not wait for radical changes in its current echelon-above-division and echelon-above-corps force structure to align itself with emerging concepts. As shown in recent combat operations, engineer soldiers and leaders are equal to the challenge. Engineer organizations, once liberated from traditional employment concepts, can embrace transformational concepts and embark on the road to more modular, agile, and responsive forces.



Colonel Toomey commands the 555th Engineer Group at Fort Lewis, Washington. He is a graduate of the U.S. Military Academy, the Naval War College, and MIT. He has had numerous command and staff assignments, to include Commander, 14th Engineer Battalion, Fort Lewis, Washington.

Endnotes

¹Unit of Employment (UE) Operations White Paper, Training and Doctrine Command Analysis Center (TRAC), 23 January 2004, p. 39.

²Ibid, p. 12.

³Lieutenant Colonel Bryan Watson, *Future Engineer Force Brief*, U.S. Army Engineer School, Fort Leonard Wood, Missouri, 27 February 2004.

SUPPORT FACILITIES FOR THE FUTURE FORCE

By Mr. Larry Allen and Mr. Kirk McGraw

Evolving Future Force doctrine focuses on executing decisive offensive and defensive combat operations—winning the war—but little thought has been given to Future Force missions such as stability and support—winning the peace—and to operational support facilities¹ needed at all levels of conflict. The logistics community will doctrinally drive support facility requirements. The U.S. Army Corps of Engineers will drive site selection, construction technologies, and environmental concerns. The U.S. Army Maneuver Support Center (MANSCEN) schools—Engineer, Military Police, and Chemical—will drive the doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) requirements for site selection, construction, environmental concerns, and all aspects of protection for these facilities.

This article attempts to translate current and past force requirements for base camps and supply depots into the context of the still-evolving Future Force. By doing so, requirements for future support facilities² can be determined and provided for as the Future Force evolves. As the Future Force gains more definition, the true requirement for future support structures will also gain more definition. The purpose of this article is to start discussion about Future Force support facility needs.

A Historical Perspective

Armies have always needed and used base camps and supply depots. Valley Forge was a base camp where General George Washington's men wintered over to wait for better fighting conditions. City Point, Virginia, was General Ulysses S. Grant's supply depot for the Battle of Petersburg. Base camps and supply depots were located all across Vietnam, and the Army is using base camps today in South Korea, Kosovo, Bosnia, Afghanistan, and Iraq.

Base camps and supply depots served four basic purposes for past armies:

- Buildup, drawdown, and stockpiling.
- Lodging and planning (to include beddown and feeding).
- Protection.
- Cultural separation (for example, separating American troops from defeated adversaries, such as Germans at the end of World War II, or from different cultures, such as American troops in the Muslim world today).

While each of those tasks might be handled without them (the British commandeered civilian housing during the Revolutionary War, for example), base camps provide the best overall solution.

The Future Force

As a "joint force," the Future Force is compatible with the Air Force, Navy, and Marine Corps. The joint force concept is more than a simple deconfliction of service-specific operations. It is the "warfare of combinations" extended beyond a single service and reaching down to the tactical level. This implies interoperable forces within each service for operational efficiency and interdependent forces among services for maximum effectiveness when combined. These forces are focused on leveraging the best potential tools of speed, operational reach, staying power, and precision offered by the strengths of each service. The very nature of "jointness" must be rooted in trust and commitment among the services.

As an expeditionary force, the Future Force goes beyond rapid deployment on short-duration missions. There is also a critical endurance aspect to our expeditionary force mindset. It must be both responsive to crisis and capable of sustained engagement—able to fight at multiple points on arrival, particularly in the austere environments that will likely be the norm. An expeditionary force can contend with the uncertainty over when and where it will be deployed and what it will be asked to accomplish. It is comfortable fighting for information versus depending on fighting with information. It is made up of adaptable formations and operations, not trained and equipped for a known array of predictable threats. An expeditionary force can contend with profound changes in the context and character of the conflict.

The Future Force is designed to fight with minimal forces, but with maximum technology that tracks friendly and enemy operations. This will allow the Future Force to identify the threat and reduce it almost simultaneously. Future Force concepts project at most a medium, unified force with light, highly lethal, highly dependable weapons systems. Heavy forces will not be required.

Army plans for the Future Force call for rapidly deploying a modular force into a theater of operations ready for combat, where it will then engage in short, high-intensity fights enabled by its superior lethality and situational awareness and understanding. The Future Force will bring everything it

needs, eliminating the need for a buildup of supplies, personnel, and equipment. It will develop the situation out of contact, either at its home station or en route. This will allow it to "see first, understand first, and act first" through superior intelligence, information management, and collaborative planning. It will finish decisively by executing strategic and/or operational maneuver to strike the enemy's center of gravity at the decisive time and place. This force will be able to engage in combat operations 30 minutes after landing and sustain itself for a number of days during combat operations. During this time, the unit of action (UA) will be self-sustaining until it can replenish in stride or rotate to a "UA recycling point" provided by the next higher organization, the unit of employment (UE). The UE supplies subordinate UAs through multiple entry points within its operating radius and with a 48- to 72-hour planning horizon. The UE accomplishes force protection through decentralized, highly mobile operations occurring along multiple routes, relying on superior situational awareness and understanding, maneuverability, and standoff engagement. Future Force support facilities are to be pushed back at least to intermediate staging bases (ISBs) and optimally to the continental United States.

Need for Support Facilities

The Future Force logistics concept emphasizes velocity over mass, meaning that an agile, high-speed inventory in motion will be used rather than building large in-theater stockpiles. The Future Force will be resupplied and sustained during additional combat operations through "pulsed logistics" rather than by conventional, linear techniques. These operational parameters imply that the UE must be able to rapidly identify potential sites for critical command and control and sustaining nodes and develop a

sustainment infrastructure with so little effort and materiel that it can be abandoned if need be.

But there are reasons why support facility contingency plans should be incorporated into each operations plan:

- Until the entire Army is modernized to Future Force standards, including reserve, maneuver support, and maneuver sustainment elements, support facilities will be needed to support the current force modules, including joint forces. For example, the Army is charged with providing supplies to Marine Corps forces ashore for any duration over 30 days. Also included are our allies and other coalition forces. Each will require support facilities for their operations if they are not at Future Force standards. Standard reception, staging, onward movement, and integration (RSOI) protocols would apply in these cases and may for some time bleed over into the Future Force.
- It may be necessary to use support facilities to redeploy forces, liberate a country, or sustain postwar recovery efforts by using them as training facilities to reestablish a police force or military in the country. U.S.-led conflicts may devolve into occupation (in the case of Germany and Japan at the end of World War II) or long-term support (in the case of South Korea) and almost always devolve into reconstruction. Unless that reconstruction is to be performed entirely by contractors (and given the nature of postconflict casualties in Iraq, that is unlikely), then certain Army and joint forces will be needed to perform or supervise that reconstruction. While it can be argued that the Future Force will surgically remove the threat with precision effects without creating mass damages from war operations, that has not been the case in Iraq, where weapons with accuracy approaching Future Force precision were used. Further,



Advanced technologies will reduce site preparation time and logistics requirements, enabling support elements to keep pace with maneuver units.

adversaries may not feel constrained to limit damages and could adopt a scorched-earth policy.

- The current force corollary to the Future Force UA is the small, self-contained force, such as Army Special Forces and Navy SEALs. These forces do not need support facilities when they are in the operational environment, but they do need support facilities located in safe havens for planning and resupply. The Future Force is likely to follow this pattern, but with endurance as a core competency, for up to 72 hours. Units will then be cycled out of the fight for replenishment, and it is neither practical nor desirable to expose exhausted troops to a long march back to their point of entry (which may not be controlled).
- There are finite numbers of aircraft and ships available for force projection missions. Rather than increasing during a conflict, this number is likely to go down as other needs arise and as damage occurs. Maintenance also drives the number of aircraft and ships available and is directly proportional to their use. The more sorties flown by a C-17 and the more landings it makes on primitive or unimproved airfields, the more maintenance will be required on that aircraft. Navy vessels have similar constraints. For those reasons, the Air Force will want improved airfields and the Navy will want improved ports and harbors as soon as possible, thus leading to the development of support facilities for security, storage, and maintenance. Air Force RED HORSE and PRIME BEEF units are not configured for large-scale construction efforts. Construction is, and will probably remain, an Army responsibility. The Army is also responsible for port construction.
- The requirement to care for enemy prisoners of war (EPW) and displaced persons will continue to require support facilities.
- The scenario of the fight may change after arrival, creating the need for a longer stay and for a support facility.
- Not all battles, conflicts, or wars will end quickly, thus establishing the need for support facilities for efforts such as military operations other than war and foreign humanitarian assistance.
- If the goal of an effort is a regime change, then additional assistance will be needed to fill the ensuing vacuum and to help ensure the success of the new regime.

What Might Be Needed

There will be a constant need for force beddown, logistics support, medical treatment, internment, and refugee holding facilities to sustain Army operations in the contemporary operating environment. Currently, with few exceptions, this sustainment infrastructure must be in place or in the process of being built before any force deployment and must remain in place to sustain operations. As the force transitions to the Future Force, there will still be a requirement for sustainment infrastructure before or during any force deployment. This up-front requirement will decrease as the

Army transitions to the Future Force because of its embedded sustainment capabilities. However, it is likely that the Future Force will always require some form of in-theater infrastructure to sustain operations. Otherwise, where would EPWs be interned and refugees be sent? What about logistics support to multinational or coalition forces not organized along Future Force lines? Where will the pulsed logistics support originate, and how will it meet customs requirements to redeploy? That is not to say that support facilities will not change from today's norm. These facilities must be scalable, must reduce the logistics tail, must consider the environment, and must leverage technology to develop solutions out of contact. They are most likely to be built and maintained by military engineers and contractors. To enable the Future Force, there will be varying levels of support facilities. Existing facilities will be used where available; and where they are not available, tentage and other temporary structures will be used. Only in the direst of circumstances will new construction take place.

The largest support facility would be an ISB, a 10,000- to 20,000-person installation in a relatively safe location with a high level of infrastructure, heavily supported by contractors. This would be the most permanent of the three levels of facilities, and would use existing facilities if possible. If that is not possible, then temporary facilities would start with tentage and range upward to more permanent construction such as Force Provider modules, Southeast Asia (SEA) huts,³ trailers, containers, concrete masonry units, and existing buildings. Examples of these ISBs from past experience include England serving as the staging area for Allied forces preparing to invade Europe in World War II, Okinawa serving as a giant supply depot for the Vietnam War, and Saudi Arabia providing support facilities for Operations Desert Shield and Desert Storm.

A much smaller type of support facility could be called a forward operating base (FOB). Because the surrounding population might not be friendly, these facilities would need to be as self-sufficient as possible. These 100- to 200-person temporary installations would be small fortresses with high levels of self-sustaining infrastructure and might be located in unstable locations for peacekeeping and other operations.

The most flexible type of support facility might be called a forward operating location (FOL). These locations would be flexible 50- to 500-person temporary facilities in the battle zone but not near openly hostile areas. Very light temporary shelters and a tight sensor perimeter would characterize them.

Each of these facilities (and they probably are not limited to just three types) will likely change over time. Facility design and construction will be governed by the time available, the size of the force supported, and the duration of operations. The size of the engineer force available will also be factored into design and construction standards. Initial entry might require a number of FOLs to control key objectives. These would change over time into larger establishments with more facilities and creature comforts. What would distinguish them from today's norm would be their ability to be moved from one site to another as the situation dictated. As has been seen in

Iraq, overhead protection from mortars and rocket-propelled grenades is likely to remain a constant.

Technologies must be developed that will enable the UE to quickly and flexibly establish support facilities. These technologies will reduce logistics requirements by selecting sites that best meet unit-tailored requirements and provide modular, lightweight, redeployable shelter systems and minimize site preparation. This will allow the Future Force to—

- Generate a set of sites ranked according to the commander's priorities, such as force protection, proximity to water, and availability of construction materials and equipment.
- Develop a mission-specific site plan with integrated force protection.⁴
- Construct lightweight, low-cost, all-weather shelters using innovative techniques such as thin-shell composite structures that provide SEA hut performance characteristics with a fraction of the resources. The technical challenge is to identify material solutions meeting functional criteria such as cost, weight, density, and fire rating and construction criteria such as low effort, modularity, and redeployability.

Future support facilities are likely to share a number of characteristics. They may—

- Be joint.
- Be expeditionary.
- Have a smaller footprint.
- Be dispersed.
- Be relatively self-sustaining, capable of independent operation with built-in water production, power production, and waste treatment/disposal independent of local materials and labor.
- Be quickly erected modular designs.
- Require minimal site preparation.
- Be mobile, with minimal lift/transportation assets or organic means.
- Have plug-and-play modules capable of rapid expansion, contraction, and upgrades.
- Be rapidly assembled and disassembled by a small workforce or remote-controlled robots.
- Have built-in force protection, to include sensors, self-defense capability, lethal and nonlethal weapons; passive force protection measures such as standoff distance, dispersion, barriers, and overpressure protection against chemical, biological, radiological, and nuclear hazards; and perhaps be capable of providing their own 360-degree hemispherical protection, to include protection for fuels, munitions, and aircraft.
- Be capable of incorporation with existing structures.
- Use local materials and labor where they are available.

- Be environmentally friendly, to include self-contained waste treatment plants and "cradle-to-grave" site management.
- Be able to incorporate modern inventory control techniques, such as just-in-time arrival and throughput with minimum storage of supplies.
- Be able to provide sustainment support to the force immediately upon entry into the theater.

Conclusion

The Future Force will provide capabilities unmatched by today's Army. It will be a highly flexible, mobile, and lethal force on tomorrow's battlefield. But its centerpiece will still be the service member, who requires periodic rest to maintain the edge provided by superior technology. Support facilities will adapt to Future Force needs and those of the geographic location, proximity to the fight, and expected longevity. But the Future Force will not succeed without support facilities to repair battle damage, rest troops, and sustain noncombat operations. That is why it is so important that we start today to define the Future Force's support facility needs. 

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Mr. McGraw is the Project Manager for Forward Facilities Footprint Optimization at the Engineer Research and Development Center's Construction Engineering Research Laboratory. His current research areas include remote-sensing technologies, site selection, base camp planning, and Class IV (construction) planning factors. He holds bachelor's and master's degrees in mechanical engineering from the University of Texas at El Paso.

Endnotes

¹ Just as the UA and UE concepts provide a way to look beyond current force structure, the term "support facility" is used in this article to describe Future Force base camp and supply depot requirements.

² In conjunction with this discussion, the issue of airfield improvements may require a forward presence before entry to improve airfields to the minimum acceptable level for Air Force certification.

³ SEA huts were first designed for the Vietnam War.

⁴ This could require reachback to U.S. Army Corps of Engineers assets (field force engineering) to assist with site layouts requiring minimal construction effort. Constraint-based layout techniques will support dynamic reconfiguration to account for the effects of terrain.

The Tale of Two Towers

By First Lieutenant Ryan J. Johnson

Charlie Company, 52d Engineer Battalion (Heavy), attached to 1st Brigade Combat Team, 101st Airborne Division, received the mission to build two rappel towers for the division's Air Assault School at Qayyarah West (Q-West) Airfield, Iraq. Charlie Company is an Army Reserve unit with headquarters and two platoons at Fort Carson, Colorado, and a detachment that includes earthmoving and maintenance troops located at Santa Fe, New Mexico. The company's 2d Platoon (with help from the maintenance troops) had six weeks to design and construct the towers. The goal was to replicate the tower at Fort Campbell, Kentucky, but resources and time would not permit that. Instead, the engineers used an existing tower for the main tower and pieced together a smaller tower from a container express (CONEX) frame and a radar dish housing.

Every rappel tower must have a solid foundation to withstand the forces that act upon it. The foundation of the existing tower was two flatbed railcars positioned side by side. The tower sat on two 9-inch steel I-beams that connected the rail cars. This foundation seemed solid, yet when the engineers first saw the tower, it was 45 feet off the rails. The railcars, and hence the tower, had to be moved back into position. Using three D7 dozers and a heavy expanded-mobility tactical truck (HEMTT) wrecker, the platoon moved the railcars back onto the rails without damaging the tower. At this point, Charlie Company's design team ensured that the tower was structurally sound before making any modifications.

The tower was fabricated using 6- by 6- by 1/4-inch angle iron with both pinned and fixed connections. The four vertical members were welded at the base to the 9-inch I-beams that connected the two railcars. The tower consisted of five sections that were 9 feet 10 inches by 8 feet 8 inches and connected by steel plates with bolted connections. Each plate consisted of eight

1/2-inch-diameter bolts, where two plates connected two vertical members. Cross-bracing and horizontal members between each section were 2- by 2- by 1/2-inch angle iron. After a visual inspection and mathematical structural analysis, leaders decided to use the existing tower as the starting point for the main tower.



Charlie Company, 52d Engineer Battalion, completed this 43-foot main tower for rappel training at Q-West Airfield, Iraq.

Many modifications had to be made. To prevent the tower from moving, the railcars were welded to the rails, the brakes were welded closed, and the tension cables were refastened and tightened. Before any construction could take place, the design team had to ensure that the tower would not tip over from the wind or the force of rappelling students. Leaders found the tower to be sufficiently supported by the railcars.

As these modifications took place, the design team worked to complete the tower. The first area to be addressed was the wooden stairs, which had to be strong and safe. A zigzag design with a landing between each flight ensured that the least space possible would be used. The vertical members were 4- by 6-inch rough-cut lumber joined by a 1/2- by 18-inch steel pole through the center of each member with a 2- by 6- by 18-inch lumber splice on each face. The stair risers and treads were cut from 2- by 10-inch material. At completion, the system consisted of 11 landings with 12 sets of stairs.

The landing area needed room enough for the rappellers to land and for the belay person to maneuver. The problem was that the railcar was 5 feet off the ground and did not provide enough space for soldiers to maneuver. The solution was to build a platform on top of the railcar that would accommodate students and instructors. The design for the platform was similar to a deck raised off the ground, with reinforcements in the landing areas. The main deck rested on 4- by 4-inch studs spaced every 4 feet with 4- by 6-inch stringers and 2- by 6-inch floor joists. The joists were spaced at 16 inches on center except for the landing areas, which were spaced at 12 inches on center. The completed deck measures 45 by 58 feet and is enclosed by handrails, with stairs leading up both sides of the deck. Soil was pushed up along the other two sides of the deck so that soldiers would have adequate room to run off the ropes without fear of falling over the side.

After the tower, stairs, and landing areas were built, the top platform and sides of the main tower were constructed. Two sides of the tower were planked with 2- by 6-inch material for rappel familiarization. One side was to be a free-fall side that simulated rappelling from a CH-47 Chinook helicopter. The top platform had to accommodate six soldiers at a time, so each side had two sets of primary and secondary hookups. In addition, the free-fall side needed to extend at least 8 feet from the side of the tower to ensure that soldiers would not collide with the tower. Welders from the maintenance section constructed a top platform using salvaged materials. Five-inch I-beams were welded into place to mirror the shape of the



The completed 30-foot rappel tower has two free-fall sides.

existing top platform. The extension for the free-fall side was fabricated into this new platform, and then the entire platform was raised into position using a crane. Once the new platform was welded to the existing platform, it was covered with 2- by 10-inch lumber on its weak axis to provide a nonslip surface. To ensure safety, a double rail system was placed around the platform. These modifications completed the main tower and provided a good start toward completing the mission.

The next phase of the project was to enhance the rappel site by adding a second tower. The original plan included a 30-foot planked rappel side with a 20-foot inclined ramp to practice rappelling techniques. The material used was gathered from six radar dish housings. Each housing was 11 by 8 by 8 feet. The plan was to weld the housings together, then weld the ramp to the combined dish housing. However, the cadre arrived at Q-West and brought some changes to the project. They liked the main tower, but instead of a large inclined ramp protruding from the smaller tower, they wanted two smaller inclined ramps attached to the deck that had already been constructed.

The biggest change, however, was to have two free-fall sides on the 30-foot tower. The radar dish housings were



Charlie Company's maintenance personnel place the top platform of the main rappel tower.

discarded, and new materials were added. Charlie Company scoured through wreckage left behind from the first Iraqi war and found materials that would be much stronger. The main structural support of the tower is a 20- by 8- by 8-foot CONEX frame standing on end. Three sections of 6-inch-square tubing with 1/4-inch-thick walls made up the entire frame. This did not produce the required 30 feet of height, so Charlie Company used one of the radar dish housing units for the additional 10 feet. Even the design team felt it would be a tough job to stack the housing unit on top of the CONEX frame, but the plan came together ahead of schedule. The radar dish was welded to the frame, and reinforcement was added to support the structure. The company's maintenance troops worked many hours salvaging pieces of steel from other radar dish housings to use as reinforcement splices. In addition, they had to construct a stronger foundation to prevent tipping.

The only foundation for the CONEX frame that formed the base of the tower was the concrete it rested on. Its own mass would not be enough to support the structure once forces were applied to it, so a foundation was designed that would be structurally sound without sacrificing maneuvering space or height. The solution was to fabricate 15-foot extensions from each side of the tower and case the extensions in a concrete pad. Soldiers welded 5-inch I-beams to the base of the tower and placed 12 inches of concrete over the entire extension area. Now that the tower stood 30 feet tall, it needed stairs to take soldiers to the top.

The stairs were almost a mirror image of those at the large tower and went up in just a third of the time. The real difference

in the second tower was the top platform. The cadre wanted two free-fall sides and no planked sides. The maintenance personnel had no problem fabricating a top platform that would allow four students to hook up at a time. Each free-fall side had primary and secondary hookup points with a bar running across the hookup point to simulate a CH-47 Chinook helicopter. The hookup points, each handmade so that a snap link could be inserted without damaging the rope, were also fabricated from scrap metal found at the Q-West Airfield. Customized fabrication was a recurring theme throughout the project due to the time constraints and lack of available materials. Charlie Company's soldiers had the ability and knowledge to fabricate all the parts needed to accomplish the mission.

Charlie Company had experience in tower construction from a previous mission for Joint Task Force-6, but the learning process was intense for this mission. However, the long hours and hard work paid off when the first class graduated from the Air Assault School at Q-West. When the school went back to Fort Campbell in December 2003, more than two thousand soldiers had earned their air assault wings while deployed to a combat zone in Iraq.

First Lieutenant Johnson deployed to Iraq in April 2003 with the 52d Engineer Battalion, Fort Carson, Colorado, which was attached to the 101st Airborne Division (Air Assault). He graduated from the United States Military Academy with a degree in civil engineering and is a graduate of the Engineer Officer Basic Course.

Iraq Museum Reopens

By Staff Sergeant Conrad College

U.S. soldiers and Baghdad University staff, faculty, and students mingled on 3 December 2003 at the university's Bab Muadham campus for a historic day. The Iraq Museum of Natural History was reopened, a new Internet café began serving patrons, and a refurbished child care center for staff and faculty opened its doors during the ceremonies.

The three projects were a cooperative effort of the Coalition Provisional Authority (CPA), the Ministry of Higher Education, the University of Baghdad, and the U.S. Army. The renovations are part of an ongoing effort by the coalition military, the CPA, and the U.S. Agency for International Development to rebuild Iraq's educational system.

The 16th Engineer Battalion, 1st Brigade, 1st Armored Division, was in charge of the three projects, which took about six months to complete. The Army provided more than \$10,000 for the work.



Iraq Museum of Natural History

Looters had badly damaged the museum, stealing or breaking displays, fixtures, and every piece of glass. Many of the exhibit cases are still empty. Iraqi contractors were hired to repair the facility, replacing broken glass and missing fixtures to allow the museum to restart its role in scientific research and public education. As part of the recovery process, the museum has established relations with American and British natural history museums.

There was no Internet café at Baghdad University before coalition forces arrived. The CPA and the Ministry of Education provided \$40,000 for the computer equipment and Internet satellite service, and local contractors were hired to refurbish the building. There are now 20 new computer stations in the café, which will provide a link for students to the rest of the world.

More projects are underway. Coalition forces are working with the Ministry of Higher Education to improve schools throughout Baghdad. A number of schools still require repairs and renovations, and there are still books to be printed and delivered.

Staff Sergeant College was a public affairs noncommissioned officer with the 372d Mobile Public Affairs Detachment, based in Nashville, Tennessee. He has a master's in journalism from Ball State University.



Museum reopening dedication ceremony

Bridging the Gap – Modernizing Army Bridge Units



By Lieutenant Colonel Andrew DiMarco

In early 2003, the Program Manager for Bridging began fielding two new bridge systems to the Army's multirole bridge companies (MRBCs): the improved ribbon bridge (IRB) and the dry support bridge (DSB). Both systems are integral components of the MRBC's objective capability.

The Army designed MRBCs to give commanders a flexible and adaptable unit that can accomplish both float- and fixed-bridge missions, are 100 percent mobile (every bridge load has a prime mover), and take advantage of product standardization. MRBCs are being upgraded with the common bridge transporter (CBT), which is a variant of the heavy expanded-mobility tactical truck (HEMTT); palletized load system (PLS) trailers; and standard PLS flatracks. Every bridge load, whether it is related to the IRB or the DSB, is palletized so that any CBT or comparable load-handling vehicle could carry, deliver, or reposition palletized bridge loads. MRBCs are optimized to conduct simultaneous fixed- and float-bridge operations.

Improved Ribbon Bridge

The IRB system provides enhanced capabilities to the MRBC by increasing military load class (MLC) capability from MLC 60 tracked (T) to MLC 80T/110 wheeled (W) in water speeds up to 10 feet per second (about 6 miles per hour). This system is a one-for-one replacement for the improved float bridge (IFB), which is reaching the end of its service life. The system is composed of M16 ramp bays and M17 interior bays that can be interconnected into rafts or bridges over nonfordable water gaps. Each MRBC is authorized 30 IRB interior bays and 12 IRB ramp bays, providing 210 meters of bridging.

The IRB is deployed in a manner similar to its IFB predecessor, and the new system is fully interoperable with CBTs, PLS trailers, bridge-erection boats (BEBs), and supplementary sets. The IRB also interoperates with the IFB and the German float-bridge system, but at reduced MLC ratings.



Improved Ribbon Bridge in Iraq

While dimensionally similar to the older IFB, the IRB is a new design with internal and external enhancements. Both the ramp and interior bays feature an aluminum strong-back forging to increase load-carrying capability, and the IRB ramp bay—

- Has a contiguous ramp end, thus eliminating the IFB's throw ramps.
- Incorporates a hydraulic pump that uses a biodegradable fluid.
- Can reach bank heights of more than 2.5 meters, providing access and egress improvements over the IFB.
- Has a deck width of 4.5 meters, allowing two-way traffic for smaller vehicles for the first time.

The IRB is externally transportable by CH-47 Chinook and CH-53 Sea Stallion helicopters and internally transportable by C-130 aircraft when partially dismantled. The IRB can use the existing anchorage system from supplementary sets for long-term placement.

The IRB program is in full-rate production after having achieved type classification standard and a full materiel release during May/June 2003. The Program Manager for Bridging fielded 126 IRB bays to the 74th, 502d, and 814th Multirole Bridge Companies before they deployed to Southwest Asia. These units successfully used the IRB system throughout Iraq.

Dry Support Bridge

The M18 DSB system brings a revolutionary change to the MRBC. The DSB relies on a mechanical system to significantly reduce soldier effort and improve operational capability to the force. The DSB replaces the medium girder bridge (MGB), while doubling the gap-crossing capability of each MRBC. It is intended to fill all 40-meter-or-less, dry-gap bridging roles from the brigade rear to the communication zone ports in a variety of tactical situations.

Each MRBC is authorized four DSB systems, each consisting of a PLS-based launch vehicle and a modular bridge that can span gaps up to 40 meters. A crew of eight soldiers can transport the entire system and deploy a 40-meter bridge in 90 minutes or less. Bridge loads are modular and palletized onto seven flatracks that are transported via organic CBTs and PLS trailers. Soldiers can also construct two shorter bridges, up to 22 and 28 meters long respectively, from each DSB system.

The M18 DSB system is composed of two subsystems, the M1975 launcher vehicle and the M19 DSB. The M1975 uses a hydraulically operated launch system integrated onto a standard PLS chassis and a set of launch beams that is carried as a separate palletized load. A launch beam is cantilevered over the gap that supports the bridge as it is built and projected across the gap. The labor required to emplace and remove the bridge is significantly reduced by the use of an integrated, materiel-handling crane, as well as by the ability of CBTs to maneuver the palletized bridge loads around the construction site easily.



Dry Support Bridge

The M19 DSB is a modular, all-aluminum bridge. Although some of the components seem similar in design to the MGB, the number of components has been drastically reduced and the bridge is a new design. A 40-meter bridge consists of 2 ramp modules, 5 parallel modules, 2 end beams, 20 approach ramps, and 24 bridge pins. Each module has curbs and drivers' aids integrated into it, and modules fold up onto themselves for transportation. The bridge has a 4.3-meter roadway and supports MLC 80T/110W. The bridge is also fielded with a new anchorage system for longer-term use. To further reduce labor requirements, the anchorage system features an onboard pneumatic hammer, which is powered via standard connections to the launcher vehicle or organic CBTs.

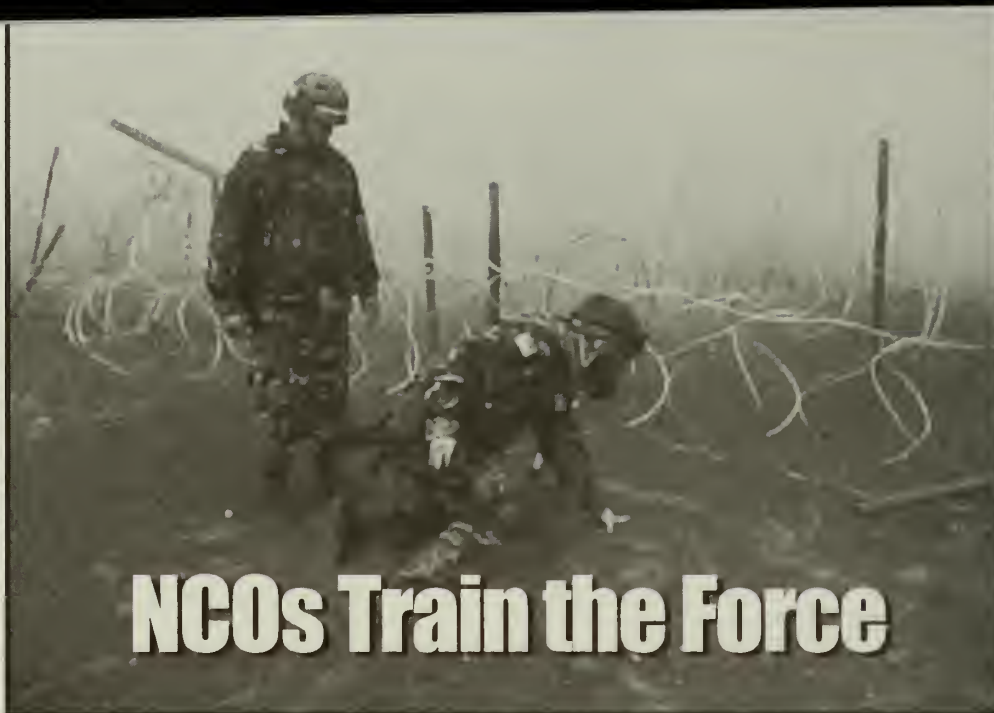
The DSB program transitioned into full-rate production in May 2003 and attained full materiel release in June 2003. The Program Manager for Bridging fielded four DSB systems to the 74th Multirole Bridge Company in February 2003 just before its deployment to Southwest Asia, and the system successfully supported operations there.

Summary

Additional information on the IRB and DSB systems, as well as other systems managed by the Program Manager for Bridging, can be found at the Army Knowledge Collaboration Center or at <http://peocscss.tacom.army.mil/pmbridging.htm>. >



Lieutenant Colonel DiMarco is the Acting Product Manager for the Unit of Action Reconnaissance, Surveillance, and Command and Control Vehicles within the Program Management Office, Unit of Action. His past assignments include Assistant Project Manager for the Dry Support Bridge System; Department of the Army Systems Coordinator for the Assistant Secretary of the Army for Acquisition, Logistics, and Technology; and company commander, 62d Engineer Battalion. A graduate of the Army Command and General Staff College, Lieutenant Colonel DiMarco is Program Management Level III-certified and holds a master's in systems acquisition management.



NCOs Train the Force

By Captain Maycros I. Baez

"United States Army Forces Command (FORSCOM) mobilizes, trains, prepares for deployment, and deploys units required to expand the Army to meet commander in chief (CINC) requirements. When directed, FORSCOM demobilizes units no longer needed to meet war or other national emergency requirements."

*—FORSCOM/ARNG/USAR Regulation 350-2,
Reserve Component Training*

The observer-controller/trainer (OC/T) noncommissioned officers (NCOs) are the backbone of the U.S. Army's Active Component (AC)/Reserve Component (RC) program. Responsible for the training, mobilization, and deployment of RC units, these NCOs are the silent heroes who ensure that nothing but highly trained soldiers augment and replace AC units on the frontline. The combat readiness and successful performance of RC units on the battlefield directly reflect the OC/T's enormous impact on their readiness. The OC/T's firsthand involvement in RC training directly supports the FORSCOM mission and has enhanced the Army's capability to fight and defeat the enemy around the world.

An OC/T, by definition, is a soldier tasked to provide administrative control, evaluate task performance, and give constructive feedback to participants during a training exercise. In reality, NCOs serving as OC/Ts are responsible for far more than teaching, coaching, and mentoring RC soldiers. Tasked with training, mobilizing, and deploying units to augment the U.S. Army on the battlefield, the OC/T NCOs are at the heart of the AC/RC program.

The vast majority of the AC forces are deployed around the globe in support of combat, peacekeeping, and humanitarian missions. RC forces play a critical role in homeland security and support military operations overseas. Federalized RC units support and

replace AC elements on the ground with their equipment, technical/tactical competence, and motivated soldiers eager to execute their missions. These RC units are a combat multiplier to the AC and a critical asset to the U.S. Army.

In 1992, after the first Gulf War, Congress mandated a FORSCOM training program requiring that AC OC/Ts be



An AC NCO conducts an after-action review with Charlie Company, 682d Engineer Battalion.



An OC/T evaluates a Minnesota Army National Guard soldier during engineer qualification tables before deployment to Kosovo.

assigned to the training support brigades (TSBs) to monitor and train RC units and ensure their combat readiness. The OC/T's ultimate goal in this arduous backstage work is the TSB commander's certification of the unit as combat-ready and the certainty that the trained unit will magnify combat power on the front line.

The OC/Ts are the strongest link between the AC and RC, so only the best candidates are chosen for this duty. The NCOs serving in these positions are considered the most proficient and qualified soldiers within their duty military occupational specialty (MOS). The NCOs should be branch-certified with modified table of organization and equipment (MTOE) leadership for 18-24 months to be selected. Sergeants first class who have successfully served in MTOE units as platoon sergeants, operations sergeants, and in many cases as first sergeants, are the NCOs typically assigned to this 3-year duty. These NCOs possess a wealth of knowledge and experience and quickly become an invaluable asset to the RC units they support. Doctrinally sound, proven leaders and professional soldiers, OC/Ts are the most effective tools to sustain and maintain the combat readiness of RC units.

Once selected, OC/Ts undergo a series of certifications before conducting hands-on instruction with RC units. The TSBs also follow a training plan to maintain their OC/Ts' proficiency at training, coaching, and mentoring soldiers. Annual training requirements ensure that the OC/Ts are experts on the latest doctrinal developments and the most modern equipment. Aside from the primary responsibility with the RC, OC/Ts are routinely tasked to augment the combat training centers and conduct training/certification exercises for AC units on MOS-specific training. Their expertise, experience, and professionalism make these NCOs the most efficient and versatile training tool FORSCOM has to accomplish its RC mission. In contrast with combat training center observer-controllers (OCs), OC/Ts in TSBs provide continuous coverage

for their assigned units. They are involved in each step, from the home-station planning and preparation phases to the execution and after-action reviews after the training event, as well as the planning and execution of follow-on training indicated by shortfalls in the initial training event.

This habitual relationship with specific RC units is imperative, ensuring maximum training effectiveness during the inactive duty training (IDT) conducted one weekend a month. The RC units have limited training opportunities to attain their expected proficiency level, so the unit assistants and the OC/Ts must orchestrate training events to ensure that they are effective and meet the unit's training needs during the 2- or 3-day IDT period. The average unit only has 39 days a year to train and prepare for its wartime mission. Nevertheless, the soldiers of these units are expected to perform and accomplish their mission whenever called into action. RC units understand their responsibility on the battlefield and recognize the importance of maintaining their personnel and equipment readiness at all times, so they count on their assigned OC/T for training support and oversight. Every training opportunity must meet the time restriction and the commander's intent and provide the desired training effect and valuable feedback to the unit.

Dedicated NCOs serving as OC/Ts often go above and beyond requirements when conducting hands-on training. They are the primary trainers and subject matter experts on tactics and the employment of military equipment. Sergeants first class who would traditionally train platoon-sized elements, train companies and their staffs. OC/Ts are typically responsible for three to five RC companies. Their scope of responsibility includes, but is not limited to, oversight on—

- Training.
- Mobilization.

(Continued on page 25)

Integrating Mechanized and Combat Heavy Engineer Capabilities

By Captain James Beaulieu



The lines between mechanized and combat heavy engineer capabilities blurred during Operation Iraqi Freedom. Throughout the planning stages and the conflict, Army engineers played an important role in the success of the mission. Augmenting mechanized engineers with combat heavy capabilities during the operation assured the mobility of the 3d Infantry Division (3ID) in its movement to Baghdad.

During postconflict operations, mechanized and combat heavy engineers were instrumental in maintaining the peace while performing key life-support missions. Mechanized and combat heavy engineer leaders proved that different capabilities work best when they augment each other. The result is maximum success in accomplishing any mission.

In preparing for Operation Iraqi Freedom, Bravo Company, 94th Engineer Battalion (Combat) (Heavy), detached from its parent unit and fell under the operational control of the 317th Engineer Battalion (Mechanized) to augment the engineer mission of 3d Brigade Combat Team (3BCT), 3ID. The company collocated in a 317th assembly area and integrated into that unit's operational tempo. For 15 days before the start of hostilities, Bravo Company planned, trained, prepared, and task-organized with the 317th, attaching teams to mechanized companies to augment their mobility missions. The primary mission for the combat heavy engineers in the movement north was to provide assured mobility to 3ID with the capabilities supplied by construction engineer equipment. The mechanized engineers supported Bravo Company with security and logistics while moving across the battlefield.

Bravo Company had three primary missions while under operational control of the 317th in the attack north: airfield damage repair, bridge embankment preparation over the Euphrates River, and survivability position construction. In each case, the mechanized engineers of the 317th secured the designated area of operation and access routes while the combat heavy engineers of Bravo Company followed closely behind, executing the construction mission once on-site.

Integrating the construction capability of a combat heavy company into the mission of a mechanized engineer battalion to provide mobility to a brigade combat team proved to be a success. The combat heavy capability opened options to the mechanized battalion by providing contingency mobility in the event of greater resistance from Iraqi forces. Even though resistance during the initial phases of conflict was minimal, contingency plans were in place to use combat heavy equipment if necessary to ensure the unimpeded movement of 3BCT.

Versatility is key when discussing engineer capabilities. Although there are many facets of the Engineer Regiment, all engineer units are expected to be able to execute all engineer missions. This can be difficult. The structure of the Regiment is such that mechanized engineers rarely perform construction missions, while construction engineers seldom perform mobility and countermobility missions. Working together made each unit stronger in supporting overall mission accomplishment.

Even though capabilities play a large role in the versatility of an engineer unit, the versatility of leaders at all levels can be even more critical. Leaders must understand the mechanized



Elements of Bravo Company, 94th Engineer Battalion, line up with the 317th Engineer Battalion and other units for an attack.

and combat heavy capabilities to be successful throughout all phases of conflict. This can be witnessed in Bravo Company and the 94th Engineer Battalion, where the company commander, operations officer, battalion executive officer, and battalion commander all had mechanized engineer backgrounds. The ability to understand the mechanized engineer mission and how to implement combat heavy capabilities is one that all engineer leaders should possess, but it only comes with experience and training. Rarely do junior officers leading a combat heavy platoon perform or understand the missions executed by a mechanized platoon leader. It is also rare for a mechanized platoon leader to understand the capabilities of a combat heavy platoon. This familiarity only comes with time, as officers gain rank and variety in assignments. It is the leaders who know how to execute both types of engineering who are truly valuable and can accomplish every mission.

Whether mechanized and combat heavy engineer units one day become integrated or remain permanently separated is a question asked throughout the engineer community. It appears that both units can greatly benefit from each other, providing a broad capability that could not be used when the units are separated. Time and again, when there is an important mission involving engineers, the executing unit is not solely mechanized or heavy, but a mixture of both. It seems that in any successful mission, engineers of all types have collaborated. This trend will only increase as more people realize the value of engineers' versatility.

Captain Beaulieu is attending the Engineer Captain's Career Course at Fort Leonard Wood, Missouri. Previous assignments include executive officer of Bravo Company, 94th Engineer Battalion; construction platoon leader with Alpha Company, 94th Engineer Battalion; and asphalt platoon leader with Headquarters and Support Company, 94th Engineer Battalion. He holds a bachelor's from the University of Massachusetts and is pursuing a master's in engineering management from the University of Missouri-Rolla.

(*"NCOs Train the Force," continued from page 23*)

- Certification and qualification on weapons systems.
- Overall equipment readiness.

OC/Ts also help senior leadership face challenges and solve problems that might interfere with mission accomplishment.

The OC/Ts assigned to 1st Battalion (Training Support) (Engineer), 345th Regiment (1/345th), at Fort Jackson, South Carolina, are responsible for twelve RC engineer battalions and detachments in the southeastern United States. As part of the 5th Brigade, 87th Division (Training Support), these NCOs are fully engaged in the training, mobilization, deployment, and redeployment of units supporting operations around the globe. The 1/345th has had a direct impact on operations such as Iraqi Freedom and Enduring Freedom and the Kosovo Force (KFOR) peacekeeping mission. These engineer units range from combat mechanized and corps wheeled engineer battalions to firefighting detachments. The OC/Ts face a challenge as each of the supported units has different training needs and missions on the battlefields around the world.

NCOs serving as OC/Ts are subject matter experts in their MOSs, top-notch trainers, and role models to the RC units they support. Instructors at the Observer-Controller Academy at the National Training Center, Fort Irwin, California, state that OCs must—

- **BE**—professional, technically and tactically proficient, and the example.
- **KNOW**—the unit, the rules of engagement (ROE), and the standards.
- **DO**—provide observations, show cause and effect, and facilitate learning through the after-action review process by providing purpose and direction.

The OC/T NCOs are the backbone of the U.S. Army's AC/RC program. The combat readiness and successful performance of RC units on the battlefield directly reflect the OC/T's enormous impact on their training. The OC/T's firsthand involvement in RC training directly supports the FORSCOM mission and has enhanced the Army's capability to fight and defeat the enemy around the world.

Endnote

FORSCOM/ARNG/USAR Regulation 350-2, *Reserve Component Training*, 27 October, 1999, Chapter 1, Reserve Component (RC) Training Mission, Paragraph 1-1, page 3.

Captain Baez is an OC/T team chief with the 1/345th Regiment (Training Support) (Engineer). His previous assignments include the 536th Engineer Battalion (Combat) (Heavy) in the Republic of Panama, 8th Army in the Republic of Korea, 84th Engineer Battalion (Combat) (Heavy) in Hawaii, and Fort Jackson, South Carolina. He holds a bachelor's in industrial management from the University of Puerto Rico and is a graduate of the Engineer Officer Advanced Course.



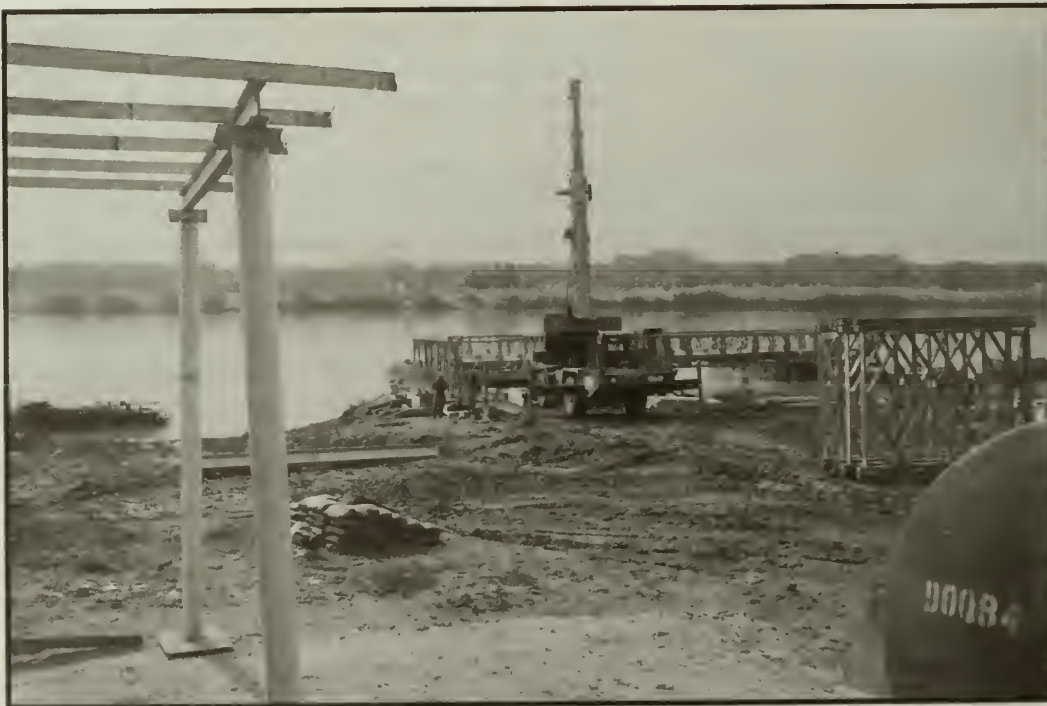
The Tikrit River Bridge

By First Sergeant Gary Fioretti

The Tikrit River Bridge project began on 13 October 2003. Another bridge across the Tigris River was needed to facilitate civilian traffic flow while the main bridge in Tikrit closed for reconstruction. Several engineer specialties worked closely on the project, each being responsible for a different role to complete the mission.

The task organization for the mission was made up of a platoon of combat engineers, a combat support equipment

(CSE) platoon, and a bridge platoon. Bravo Company, 5th Engineer Battalion, would provide security and work with the CSE platoon, from the 229th Engineer Company (CSE), to emplace force protection measures. The CSE platoon was to construct a 150-meter causeway with erosion control measures and assist with force protection. Bridge crewmen from the 74th Multirole Bridge Company would erect and launch a 350-meter double-single Mabey-Johnson float bridge.



Soldiers from the 74th Multirole Bridge Company use a crane from the 14th Engineer Battalion to install bays at the Mabey-Johnson bridge.



Hesco bastions topped with sandbags form a bunker and guard tower.

Force protection and security were the priorities for the sappers and the CSE platoon. The sappers hit the ground first from an assault float raft and immediately began to sweep, clear, and secure the land. Once security was established, the CSE platoon—with Class IV supplies—went to work immediately. The two elements worked together to emplace triple-standard concertina wire around the jobsite perimeter. The CSE platoon built earth berms around the area, as well as several equipment parks inside the perimeter, to protect equipment and personnel from small arms fire. Raised M-113 armored personnel carrier fighting positions, protected by berms around both sides and the front, were constructed for clear fields of fire above the earth walls. The last step of force protection for the platoon was to build mortar bunkers and Hesco® bastion guard towers.

Once force protection measures were completed, the causeway was built to facilitate the emplacement of the bridge. The causeway required more than 2,100 truckloads of fill, which was obtained within the perimeter. The fill was spread and compacted, and a 1-inch layer of soil stabilizer was emplaced and geotextile stretched from the headwall to the upstream side of the bank to control erosion. Concrete blocks were stacked atop each other with both layers folded slightly in between, and the roadway was lifted, graded, and compacted in preparation for asphalt that would be laid by Iraqi contractors. The nearshore preparation was contracted as well. The Iraqi scope of work included stripping away existing concrete from the levee wall and asphalt from the road. An excavator, loader, and compactor were used to create a slope to accommodate the end span of the bridge.

The bridge, which would accommodate traffic and remain in place for up to a year, was put together with cranes, forklifts,

and excavators. Piers were built by locking together 20- and 40-foot pontoons, on top of which were welded I-beams and winch trays for anchorage.

Bays were constructed in mass quantities to expedite the overall construction. Each bay consisted of four panels, a transom, vertical and sway braces, vertical and top brace frames, steel decking, and curbing. After each span was completed, it was pushed off the rollers and onto the floating pier or pontoon and bolted into place. Then bridge erection boats pushed the spans into place and bridge crewmen pinned each span junction together.

The Tikrit River Bridge was a joint effort. Iraqi contractors and locally hired civilians were an integral part of the project, with Iraqis contributing in several areas: asphalt, nearshore preparation, welding, road repair and widening, and even force protection. This project was a true representation of the U.S. Army helping Iraqis rebuild Iraq.



First Sergeant Fioretti is with Charlie Company, 14th Engineer Battalion, Fort Lewis, Washington. He is currently deployed as part of the 555th Engineer Group, 4th Infantry Division.

Photos by First Sergeant Gary Fioretti.



A Day of My Life in Baghdad

By Sergeant First Class Ray Deering



You can smell the decaying banana skins underfoot as they mingle with the fuel and exhaust fumes. Iraqi men and boys, some no more than 10 years old, shout “mister, mister, one dollar” as they shove bundles of bananas and soda cans toward you. Yet another crossing of the Al Muthana Bridge that we helped replace on the Tigris River to improve the flow of traffic into Baghdad. There must be seventy or eighty cars jockeying for a position at the front of the traffic. Normally, there would be two lanes, but somehow it has grown to four and must merge into one to cross the bridge. Horns blow and hands wave as people shout at each other, most assuredly not words of greeting or well wishes.

Another patrol, searching the streets for improvised explosive devices (IEDs), comes to a close. But first we have to make it back to our base camp, and lately the last mile has become even more dangerous, once with an attack on one of our own—our commander. As we make the last turn onto our island sanctuary, we all lighten the mood with sarcastic comments, and the same one or two guys provide our comic relief.

We clear our weapons and head back to our rooms, where we download our equipment and grab a cold bottle of water. Junior leaders verify that all equipment is serviceable and stored neatly, while we think about the time our next mission begins and what we will do to relax for an hour before we go back to work. The married guys head for the cyber café, hoping for an e-mail from their loved ones or, more importantly, that they will catch that loved one online in a chat room. Some

make their way to the telephones to call home. Even more seek some solitude while they become consumed with PlayStation or GameBoy. This is their break from the reality of being away from the family, friends, comforts, and freedoms that they have all sacrificed to help bring freedom to the Iraqi people.



Soldiers guard a power plant in northern Baghdad.

I head to the operations center to check in with the commander and first sergeant. They didn't go along on this patrol, but they are just making their way through the doors as they return from checking on a school. We discuss the heat and how it's nice that the intense climate we suffered through during the past few months has passed. There is a lighthearted atmosphere as everyone is silently thankful that we have gone out into the sector and safely returned one more time. We discuss future missions, plan the rest of the day, and bring up the truly important question: What time is mail being picked up?

There is a bond here that no one can ever explain and that is never talked about. It overcomes the differences between rank, background, experience, and personal opinion of one another's personality. It is the appreciation for the guy beside you and what he contributes and brings to the table during this time of hardship—our generation's War on Terrorism. We complain about who may or may not be doing what, whose turn it is to perform a mission or task, why more effort has apparently been put into a plan for sporting activities than was put into the plan for an upcoming mission involving multiple units. But it is done in our own group—our leadership team.

When we are together as this leadership team, we feel that we can handle any problem that comes our way, because we are in harmony when it comes to the mission. Yet we agree to disagree among ourselves, debate issues back and forth, and jibe and harass one another constantly. It is our way of relieving the pressure of the situation, to ensure that we stay focused in front of our men. It is our way of getting our secret fears out into the open, but without losing face or displaying weakness. We use each other for that, so we can lead our men with the effort and professionalism they deserve.

I wonder if the soldiers know we do it, but does it really matter if they know that or not? They look at us as we step in front of them and present a plan for a mission as if this is going to be the one mission that will break the back of the resistance in Iraq and lead the way to our returning home. We have to try to convince them that it is the best plan that has ever been conjured up in a military mind, though we constantly search our own minds and our past experiences for the things we may have forgotten, the things we have to inject to ensure that our soldiers stay motivated, stay professional, and stay alive. None of us can afford to miss doing something that we should have known to do. These men deserve our best, and so do their loved ones.

So we finish our discussions, throw away our empty water bottles, and head back to our small units, our platoons, and our men. We put that brave face back on, because for their sake we can't afford to have a bad day. We close our minds to our families for a few more hours as we go about the business of briefing tomorrow's mission, ensuring that the guard roster is straight. We deal with the concerns that a troop might have about his wife and what she may be doing with their bank account, and we talk to the guy whose wife is due to deliver



Soldiers clear routes to prevent IED attacks.

their first child next month and when he'll get to go home to see his newborn.

We ensure that our equipment is ready, our weapons are clean, and our plan is foolproof—at least in our eyes. Then we take a few minutes for ourselves, go for a run, lift a few weights, or see if we can borrow a movie that we haven't already seen half a dozen times. But we know that soon we can lie down, and with that comes our own private thoughts about our loved ones, our kids, and our parents. And we know that when the morning comes, it's one day closer to getting back to them and one more trip back across our bridge, one more whiff of those banana skins, one more cry of "mister, mister, one dollar." In the back of our minds, we realize that we have experienced the greatest honor a soldier can ever have—leading troops in combat on a day with no casualties.



Sergeant First Class Deering deployed to Baghdad, Iraq, with Bravo Company, 16th Engineer Battalion, "Ready First Combat Team," 1st Armored Division, on 9 May 2003. He led a combat engineer platoon as a platoon sergeant until 17 November 2003, when he returned to the United States after 6½ years in Europe, including a tour in Kosovo as platoon sergeant. His previous assignments include the Combat Maneuver Training Center, 5th Engineer Battalion, and 12th Engineer Battalion during Operation Desert Storm.

Regimental Awards

Each year, we recognize the best engineer company, lieutenant, noncommissioned officer, and enlisted soldier—in each of the components—for outstanding contributions and service to our Regiment and Army. Every engineer unit in the Regiment can submit the name and achievements of its best of the best to compete in these distinguished award competitions. Only the finest engineer companies and soldiers are selected as recipients of these awards. The soldiers will carry throughout their careers the distinction and recognition of being the Engineer Branch's best and brightest soldiers and leaders. Following are the results of the 2003 selection boards for the Itschner and Outstanding Engineer Platoon Leader (Grizzly) Awards, the Sturgis Medal, and the Van Autreve Award:

Active Component

Itschner Award: Alpha Company, 11th Engineer Battalion (Combat), 3d Infantry Division, Fort Stewart, Georgia.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Kristin Graham, Headquarters and Headquarters Company, 14th Engineer Battalion (Corps) (Wheeled), Fort Lewis, Washington.

Sturgis Medal: Sergeant First Class Matthew Outten, Alpha Company, 54th Engineer Battalion (Corps) (Mechanized), Warner Barracks, Germany.

Van Autreve Award: Specialist Clifton Hall, Charlie Company, 864th Engineer Battalion (Corps) (Mechanized), Special Troops Battalion, Fort Richardson, Alaska.

U.S. Army Reserve

Itschner Award: Alpha Company, 244th Engineer Battalion (Combat) (Heavy), Boulder, Colorado.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant William R. Zinkgraf, Charlie Company, 489th Engineer Battalion, Harrison, Arkansas.

Sturgis Medal: Staff Sergeant David F. Schofield, Detachment 6, Alpha Company, 249th Engineer Battalion (Prime Power), Fort Lewis, Washington.

Van Autreve Award: Specialist Adam R. Simon, Bravo Company, 489th Engineer Battalion, Harrison, Arkansas.

Army National Guard

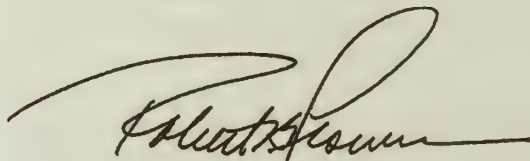
Itschner Award: Charlie Company, 1457th Engineer Battalion (Combat), Spanish Fork, Utah.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Mark L. Topp, Alpha Company, 142d Engineer Battalion (Heavy), Wahpeton, North Dakota.

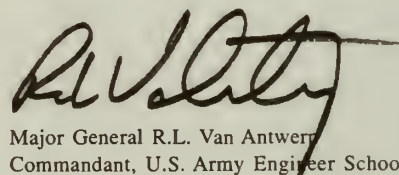
Sturgis Medal: Sergeant First Class David J. Varelas, Bravo Company, 14th Engineer Battalion (Combat), Fort Lewis, Washington.

Van Autreve Award: Specialist Kelly R. Goehring, Bravo Company, 142d Engineer Battalion (Combat) (Heavy), Wahpeton, North Dakota.

All of the nominees represented their major commands with the highest professionalism and dedication to the Engineer Corps's vision and deserve our highest praise. The award recipients were recognized at ENFORCE 2004, 26-30 April, Fort Leonard Wood, Missouri.



Lieutenant General Robert B. Flowers
Chief of Engineers



Major General R.L. Van Antwerp
Commandant, U.S. Army Engineer School

SOLDIER ENHANCEMENT PROGRAM

By Sergeant Major Thomas House and Mr. Larry T. Hasty

There is a process in the Army that was established to help soldiers get needed commercial items fielded in a short period of time. The Soldier Enhancement Program (SEP) was congressionally approved in 1989, initially for the "foot soldier," but revised in 1992 to include all soldiers. The objective of the SEP is to increase the lethality, survivability, mobility, command and control, and sustainability of the soldier through an accelerated acquisition process to get lighter, more lethal weapons and improved "soldier items" into the hands of soldiers quicker. SEP recommendations from soldiers and their commanders are highly encouraged. Participation by soldiers and their commands enhances the credibility of the program and ensures that SEP dollars are focused where they will do the most good.

Proposals go to the SEP Council, which convenes quarterly. To qualify for a SEP project, a proposal must be—

- An item that will be worn, carried, or consumed by individuals in a tactical environment.
- A nondevelopmental item that is now commercially available, off-the-shelf.
- An item soldiers are buying with their own money to make life better in the field.

Upon approval by the SEP Council, the proposal will be assigned to one of the U.S. Army Training and Doctrine Command (TRADOC) proponent schools to develop a tailored capability development document (CDD) for the item, and the CDD will be approved by that school's commandant to expedite the process. For some items, such as other government agency items or items in the General Services Administration catalog, a CDD may not be required.

The SEP is not an incentive awards program. No monetary awards are given for proposals that are adopted for use and that result in savings to the government.

Current programs in various stages of the SEP process include the following:

- Rapid wall-breaching kit
- XM102 reloadable hand grenade
- M9 pistol rail
- Blast-protection footwear
- Enhanced fuel bar
- Electric stun device
- Petroleum, oil, and lubricant (POL) handler gloves
- Family of metal detectors
- Semiautomatic sniper system
- Close combat mission capability kit
- Close quarters battle kit
- Modular accessory shotgun

- Family of suppressors
- Integrated laser white-light pointer
- 12-gauge extended-range nonlethal round
- XM104 nonlethal bursting hand grenade
- Fuel handler coveralls
- Future handgun system
- Military operations in urban terrain lifeline
- Maxillofacial shield

SEP proposals can be submitted through the automated process at <http://peosoldier.army.mil>. Proposal forms can be obtained by e-mailing Sergeant Major Thomas House or Mr. Ken Sutton at the TRADOC System Manager-Soldier office at Fort Benning, Georgia, at houset@benning.army.mil or suttonk@benning.army.mil or calling DSN 835-1189/6047/3327 or commercial (706) 545-1189/6047/3327 or mailing—

Mr. Ken Sutton
6751 Constitution Loop
Building 4, Room 632
Fort Benning, Georgia 31905

The Assistant TRADOC System Manager-Soldier at Fort Knox, Kentucky, can also provide information and SEP proposal forms. E-mail Lieutenant Colonel Craig Carson at craig.carson@knox.army.mil or Mr. Larry T. Hasty at larry.hasty@knox.army.mil or call DSN 464-3662/3519 or commercial (502) 624-3662/3519.



Sergeant Major House is the TRADOC Systems Manager-Soldier sergeant major, Fort Benning, Georgia.

Mr. Hasty is the deputy and senior technical advisor to the Assistant TRADOC Systems Manager-Soldier at the U.S. Army Armor Center, Fort Knox, Kentucky.

Correction

An article entitled "Wearing Synthetic Fiber Underwear Under the Nomex CVC Uniform," (*Engineer*, October-December 2003, page 37) contained National Stock Numbers (NSNs) for obsolete combat vehicle crewman gloves. The recommended replacements are "Gloves, flyers, summer (green)*," or "Gloves, mounted crewman," with the following NSNs and sizes:

Gloves, flyers, summer (green)		Gloves, mounted crewman	
8415-01-482-8417	4	8415-01-446-9247	5
8415-01-040-2012	5	8415-01-446-9248	6
8415-01-040-1453	6	8415-01-446-9252	7
8415-01-029-0109	7	8415-01-446-9253	8
8415-01-029-0111	8	8415-01-446-9254	9
8415-01-029-0112	9	8415-01-446-9255	10
8415-01-029-0113	10	8415-01-446-9259	11
8415-01-029-0116	11		
8415-01-482-8420	12		

* Other colors may be available.



LOGISTICAL BASE SUPPORT FOR THE POLISH MULTINATIONAL DIVISION

By Captain Christopher S. Cooper

The chief of engineers for the Polish Multinational Division (MND) faced challenges when he and his advanced party entered the Operation Iraqi Freedom theater in late July 2003. The MND headquarters at Camp Babil, controlled by 1st Marine Division, 1st Marine Expeditionary Force, was scheduled to receive more than 12,000 soldiers from more than 16 countries in three weeks. There was not enough room for everyone at Camp Babil, next to the ancient city of Babylon, and historical covenants prevented further expansion of the base. Furthermore, the closest logistical center was more than 250 kilometers to the south in an area not even within their sector.

To alleviate their space and logistical problems, the Polish MND decided to use a 10-acre compound along the Shatt Al Hillah, a stream 7 kilometers away on the outskirts of the city of Al Hillah. The site was a former Iraqi youth training center that focused on mobile bridging operations. Unfortunately, other than the natural border of the river to the west, a wall that bordered the street to the east, and civilian residences to the south, there were no force protection measures in place. Complicating matters, 20 billets, 10 administrative buildings, and several burned-out Iraqi mobile bridging pieces stood where the planned logistical base was to go. The Polish MND needed help, so it turned to Coalition Joint Task Force-7 for engineering support.

The 265th Engineer Group, a Georgia National Guard unit currently in control of the southern Iraqi sector with four battalions, received the call. After a reconnaissance of Al Hillah, the 265th developed a joint mission with U.S. Army engineers; MND forces; Kellogg, Brown and Root, the support services contractor; and local Iraqi labor to assist the Polish division.

Kellogg, Brown and Root—with an Iraqi contractor—focused on establishing the southern gate and berm, preparing the fuel and ammunition supply points, and refurbishing the buildings. U.S. Army engineers were responsible for demolishing the former Iraqi billets and administrative buildings, then constructing a protective berm surrounded by a triple-standard concertina wire fence. For that mission, the 265th selected a company (-) consisting of an equipment support platoon and a platoon of combat engineers from the 1092d Engineer Battalion, a West Virginia National Guard unit. The Polish MND supported them with Romanian engineers and equipment, as well as Hungarian soldiers to provide security. Local Iraqi workers assisted as laborers.

The mission had three phases: reduce the 30 buildings to rubble; construct the berm; and concurrently, train and supervise the Iraqi laborers. In addition, combat engineers would sweep the area for unexploded ordnance and supplement the Hungarian security force.



Engineers use a bulldozer to push debris into a protective berm around the logistical base.



Rubble from demolition projects was reused to construct force protection berms.

The first night after the mission began, a mortar attack dropped eleven 60-millimeter shells on the site. No one was injured and no equipment was damaged, but the need for force protection became acutely obvious.

An immediate problem was the extremely high water table. Next to the river, it was as close as 6 inches to the surface, so very little fill material was available for berm construction. Leaders decided to use rubble from the building demolition and several of the destroyed mobile bridges as fill material for most of the berm.

Demolition of the buildings progressed rapidly. However, loading the rubble into dump trucks and transporting it to the berm for fill material was hard on the equipment. The Iraqi buildings were constructed with a lot of rebar that wreaked havoc on tires. In one day alone, the support platoon's vehicles had 15 punctures. Their maintenance element performed admirably, establishing a close relationship with the maintenance shop at Camp Babil for replacement parts.

The Iraqi laborers quickly learned fence installation and kept pace with the berm construction. The Polish commander inspected the work one week into the mission and said that he now felt more comfortable bringing his forces into the area. He mentioned that stories about the mortar attack had been printed in the Polish press. When reporters asked what he was doing about the situation, he responded, "The U.S. Army engineers are currently solving the force protection issue for the MND forces." After 15 days on the ground, the mission was complete.



Captain Cooper is a member of the U.S. Army Reserves. He served as a combat engineer platoon leader and as a battle captain for the 265th Engineer Group during Operation Iraqi Freedom. At the time this article was written, he was the Polish MND liaison officer. He holds bachelors' in journalism and education and a master's in education. In civilian life, he is a teacher.

The Engineer Writer's Guide

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in PowerPoint®. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including

your full name, rank, current unit, and job title; a list of your past assignments, experience, and education; your mailing address; and a fax number and commercial daytime telephone number.

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CTC Notes

National Training Center (NTC)

Force-on-Force Convoy STX Lane

By Captain Christopher Kuhn

During a recent rotation at NTC, the Sidewinder team organized and conducted several situational training exercise (STX) lanes. One of those included a convoy lane that trained units on the dangers currently encountered on a daily basis by convoys deployed for Operations Enduring Freedom and Iraqi Freedom. These notes address the setup of the lane so that units can train this critical task at home station.

Plan the Training

The first step is planning the training and allocating a suitable training area to conduct the training. The convoy route should be long enough to allow each event on the lane to occur independently of each other, as well as allow for retraining on certain events. The lane is designed for a company-sized element and consists of a unit receiving a fragmentary order (FRAGO) to conduct a mounted tactical road march along a specified route. The convoy commander will conduct troop-leading procedures (TLP), issue a movement order, and command and control the convoy along the designated route. The convoy will encounter various contacts along the route, to include a civil disturbance, a rocket-propelled grenade (RPG) attack, an improvised explosive device (IED), and a near ambush. For the STX lane, the Opposing Force (OPFOR) and observer-controllers (OCs) must be identified. The following resources are required:

- OPFOR truck: 1
- Simulated RPGs: 2
- Civilian vehicles: 3
- Injured civilian on the battlefield (COB) moulage kits: 3
- Simulated man (SimMan): 1
- IED (inert): 1
- Daisy-chained IED: 1
- COBs (wedding party): 14
- Paramilitary (RPG ambush): 3
- Explosive ordnance disposal (EOD) personnel: 2
- Detainee (anti-U.S.) COBs: 3
- Suspect (possibly anti-U.S.) COBs: 3

- Paramilitary snipers: 2
- OCs: 4
- Route: Approximately 30 kilometers

Train and Certify Leaders

The training objectives for the lane for the OCs, OPFOR, and unit leaders should be to—

- Prepare for combat.
- Conduct a tactical road march.
- React to a civil disturbance.
- React to actions on contact.
- Treat and evacuate casualties.
- Call for medical evacuation.
- Perform recovery operations.
- Conduct consolidation and reorganization.

Recon the Site

The OCs and OPFOR should conduct a joint reconnaissance of the route to determine the locations of the events, rehearsal areas, and after-action review (AAR) location.

Issue the Plan

The unit should receive the FRAGO at least one day before the scheduled lane execution. This will allow the convoy commander and the unit to conduct their TLP, precombat checks (PCCs), precombat inspections (PCIs), and rehearsals.

Rehearse the Lane

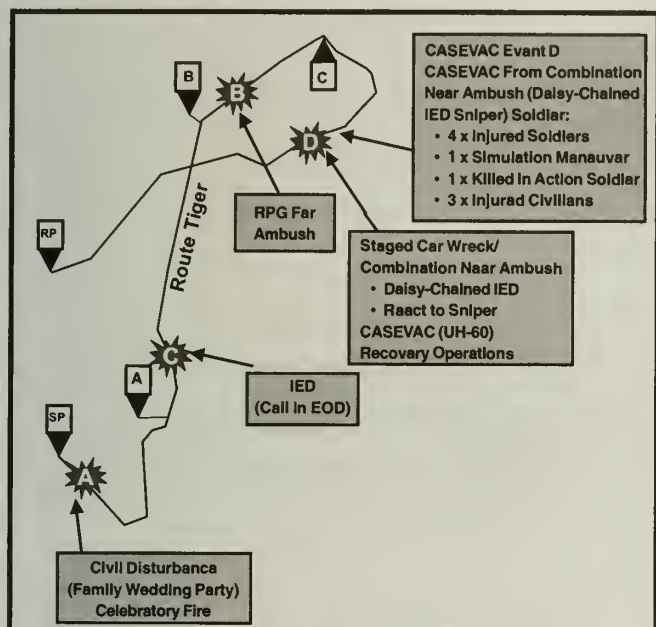
It is important for the OCs and OPFOR to conduct a rehearsal of the execution of the lane. Each event on the route should be rehearsed, to include movement to the training area, emplacement of OPFOR forces and IEDs, contact with the training unit, and criteria for disengagement. Unit rehearsals could focus on reactions to contact, casualty evacuation (CASEVAC), and movement techniques.

Execute the Lane

The lane begins when the convoy commander receives the FRAGO. The unit then begins TLP, rehearsals, and production of its movement order. The unit will have a set start point time, which allows the lane officer in charge (OIC) to ensure that the lane events are set up and ready for execution as the unit moves along the route. The figure on page 35 shows an example of a lane layout. Communication is critical between the event sites and the lane OIC. One OC should move with the convoy to give the event sites advanced notice that the convoy is approaching.

For this particular lane, the Sidewinder team emplaced four events for the convoy:

- A civil disturbance, consisting of a family wedding party shooting celebratory fire in the air.
- An inert IED placed along the convoy route.



Convoy Lane Organization

- An RPG ambush.
- A staged car wreck, consisting of a daisy-chained IED and sniper ambush.

Based on unit reactions, OCs assessed the number and type of casualties. If aircraft were available, the unit requested air CASEVAC for the wounded. If none were available, the unit conducted nonstandard CASEVAC. Additionally, the Sidewinder team used a SimMan, a 190-pound mannequin—connected to a laptop computer—that can simulate the actions of a live human being with any type of injury. It is a great tool for providing immediate feedback to a medic or combat lifesaver.

Conduct an AAR

OCs conducted the AAR at the release point of the route. An AAR could also be conducted after each event if the unit did not achieve the desired objective.

Retrain

Any event could be reset at another location along the route if the unit failed to react properly during any of the events. To do this, the route must allow enough time for the event to be repositioned without impacting the unit's movement. Additionally, the unit can stop, conduct an AAR, and retrain a particular event before continuing along the route.

Summary

The lane allowed the convoys to train on different forms of contact, as well as land navigation, CASEVAC, recovery operations, and consolidation and reorganization activities. This ensured that the units were adequately trained before executing the convoy live-fire exercise that is also available at NTC.

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Convoy Live-Fire Exercise

By Captain Timothy R. Vail

During Vietnam, combat service (CS) and combat service support (CSS) units established "gun trucks" to protect the vital shipment of supplies from Vietcong ambushes along Highway 19, the only major hard-surfaced highway that led from Qui Nhon to An Khe. Rather than equip and train CS/CSS units with dedicated firepower to ensure self-sufficient security for the moving pieces of our pre-Operations Enduring Freedom and Iraqi Freedom CS/CSS force structure, the Army anticipated and trained for a linear battlefield where CS/CSS units would be secure from high-intensity threats based on their location on the battlefield.

The 507th Maintenance Company served as a report card for the Army in the well-published accounts of the events that led to the paramilitary ambush of the unit near the eastern part of Nasiriyah, Iraq, on 23 March 2003. The paramilitary ambush resulted in the deaths of eleven U.S. soldiers and the apprehension of an additional seven soldiers.

Establish a Training Strategy

In response, NTC has established a training strategy for CS/CSS to train units to account for the 360-degree threat that makes up the contemporary operating environments (COEs) of Operations Enduring Freedom and Iraqi Freedom. Figure 1 shows the full spectrum of the COE at NTC. The capstone event of this strategy during an NTC rotation is the convoy live-fire exercise.

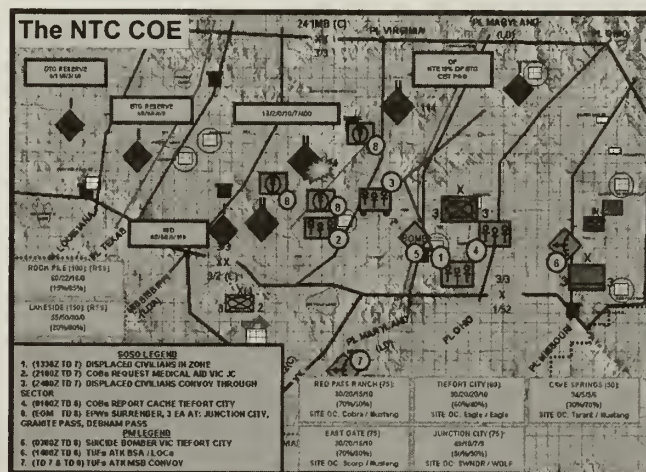


Figure 1. NTC Full-Spectrum COE

CSS units are required to analyze intelligence reports and the military aspects of terrain and conduct direct-fire planning and rehearsals for actions on contact as critical components of the troop-leading procedures (TLP) for convoys. As units execute their convoy operations, they must react to paramilitary threats that include improvised explosive devices (IEDs) and rocket-propelled grenades (RPGs) through effective direct-fire control. Additionally, units execute casualty evacuation (CASEVAC) and control as part of their actions on contact.

This live-fire scenario gives individual soldiers greater confidence in their weapons proficiency, small-unit leaders confidence in their control of direct and indirect fires, and platoon leaders confidence in conducting the critical aspects of the TLP that are required for CS/CSS units to maneuver throughout the COE. Recommended training objectives for convoy commanders and vehicle commanders, as well as home station training strategies to prepare units for a convoy live-fire exercise, are as follows:

Convoy Commanders

- Take advantage of terrain analysis route planning tools to identify terrain-based fire control measures and areas vulnerable to IED/RPG ambushes.
- Organize unit formations and vehicle orders of march to mass fires upon contact and employ the best weapons for the target.
- Ensure that well-established battle drills exist for—
 - ✓ Actions on contact (all eight forms).
 - ✓ En route vehicle jump plans.
 - ✓ Vehicle self-recovery plans (allocation and distribution of tow bars).
 - ✓ Casualty treatment and collection.
 - ✓ Calls for fire.
- Include terrain- and enemy-based fire control measures in the movement plan.
- Establish and rehearse a direct-fire plan:
 - ✓ Establish and disseminate direct-fire control measures to all soldiers (enemy locations, target reference points, fire patterns).
 - ✓ Assign sectors of fire integrated with unit formations and weapons systems location.
 - ✓ Disseminate well-established weapons control status and weapons safety posture.
- Integrate and rehearse indirect-fire support.

Vehicle Commanders

- Ensure that all weapons systems are assigned sectors of fire with clearly defined engagement criteria.
- Develop cross-leveling and reloading procedures for each weapon system.
- Issue vehicle orders, ensuring that threat, route, fire control measures, and contingencies are briefed to the crew and passengers.
- Actively control fires from their vehicle platforms.
- Know the surface danger zones (SDZs) for each weapon system on the vehicle and the sectors of fire for the other vehicles in the convoy to prevent fratricide. Figure 2 is an example of the NTC convoy live-fire SDZ.

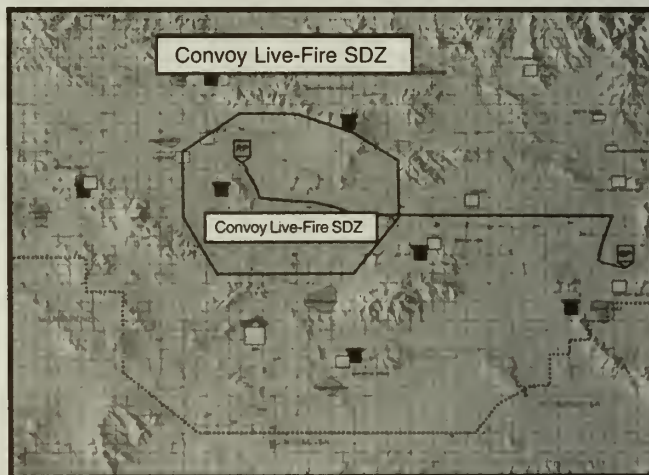


Figure 2. NTC Convoy Live-Fire SDZ

Home Station Training Strategy

- Units can train convoy operations in preparation for NTC and Operations Enduring Freedom and Iraqi Freedom at their home stations.
- Installations that have the Engagement Skills Trainer 2000 can support CS/CSS units with collective fire direction and control tasks.
- Units can request short-range training ammunition and bolt adapters from their ammunition managers in order to fire the ammunition that will reduce SDZs of weapons systems to use multiuse ranges and develop their own convoy live-fire gunnery exercises.
- Units can conduct leader training on TerraBase/MicroDEM route analysis tools that will train leaders on identifying potential target reference points and ambush locations.

Conduct the Exercise

Following are some prerequisites for conducting a convoy live-fire exercise at NTC, as well as some suggested events to enhance training at NTC and the home station.

- Ensure that all firers participating in convoy live-fire events are qualified on their assigned weapon and have conducted stationary familiarization fires from their vehicles.
- Use limiting stakes for troops firing from passenger areas of vehicles.
- Use sandbags to enhance troop areas to increase stability of individual weapon systems.
- Ensure that each vehicle has a safety who can maintain visibility on all weapons.
- Ensure that vehicle safeties can maintain constant communication and monitor and supervise the execution of the proper weapons safety postures and direct-fire engagements.
- Conduct blank-fire dry runs before executing the live fire.

- Consider adding simulated IEDs, vehicular mobility kills, and CASEVACs to advanced convoy live-fire exercises.
- Allot time for vehicle safeties to conduct after-action reviews (AARs), as well as comprehensive AARs for the convoy as a whole.
- Use a video as much as possible to evaluate fire commands, engagement techniques, fire distribution, and command and control.

Figure 3 shows the target layout for a convoy live-fire exercise.



Figure 3. NTC Convoy Live-Fire Target Layout

Summary

Due to the ever-changing COE and the dangers currently faced during Operations Enduring Freedom and Iraqi Freedom for even the simplest convoys, units must train on all aspects of convoy operations. NTC provides that training in a live-fire scenario for all CS/CSS units. Units will be prepared for the most dangerous situations by training in realistic conditions at home station as well as at NTC.

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Geospatial Teams

By Sergeant First Class Gregory T. Alston

NTC is undergoing a tremendous change that makes up the contemporary operating environment (COE). New urban areas have been built to address and identify the challenge that today's soldier might encounter in deployments for Operations Enduring Freedom and Iraqi Freedom. In the past, units have looked at urban areas as obstacles and have chosen to bypass them. However, this paradigm no longer applies.

During stability operations and support operations (SOSO), units must enter towns to conduct cordon-and-search or attack missions, establish checkpoints within population centers, or conduct raids on possible paramilitary camps in and around towns. Commanders require that terrain experts (geospatial analysts) conduct thorough analyses of the terrain surrounding population centers as well as analyze the urban terrain enabling commanders to "see the terrain."

In October 2003, the first military occupational speciality (MOS) 21U40 geospatial analyst (formerly MOS 81T topographic analyst and MOS 81Q terrain analyst) team trainer arrived at NTC. This is the first time in the history of NTC that a geospatial analyst observer-controller has been on permanent staff in the Operations Group.

Geospatial Team Trends

Most brigades or units of action (UA) deploy to NTC with a four-soldier geospatial team. Based on observations over the past six months, there are trends that units with these teams must address in order to better take advantage of this capability:

Trend No. 1: Modified combined obstacle overlays (MCOOs) are inadequate.

Recommendation: Use the Digital Topographic Support System (DTSS) to build and update the MCOO and use in predeployment training at the home station. Subordinate units must then provide feedback (bottom-up refinement) to geospatial teams based on observations "on the ground" so that the MCOO is continually updated and more accurate for the planning of future operations. Figure 1 is a sample of a MCOO developed on a DTSS by a rotational unit.



Figure 1. Modified Combined Obstacle Overlay

Trend No. 2: Brigade combat team (BCT) and UA staffs lack an understanding of geospatial team capabilities.

Recommendation: Incorporate geospatial teams into BCT/UA training as soon as possible at home station before deployment. This will allow the team to participate in as many planning processes as possible, enabling the staffs to recognize their capabilities and integrate them more fully. Figure 2 is an example of the geospatial team capabilities.

Planning

- Integration into intelligence preparation of the battlefield (IPB) – MCOO, line-of-sight/perspective views from templated enemy locations, route visibility plots to identify key terrain, and written analysis of the area of operation.
- Course of action (COA) development – Identification of COAs based on effects of weather and terrain; improvement of COA sketches to enable the commander to visualize the terrain.
- COA analysis – Support to wargaming through refined products from mission analysis; enemy line-of-sight/weapons range analysis from templated enemy locations; line of sight for BCT/UA collection assets, line-of-sight/weapons range analysis for friendly weapons systems.

Preparation

- Continued refinement of products – made available to subordinate units for their planning processes.
- Rehearsals – geospatial products such as blowups for terrain model/sketch map rehearsals.

Execution

- Imagery maps – for all subordinate commanders to fight from for their respective areas of operation, allowing them to “see the terrain.”
- “On-the-spot” geospatial analysis – for the battle staff in the BCT/UA command post, allowing them to make recommendations to the commander on the ground.

Figure 2. Capabilities of Geospatial Analysis Teams

Trend No. 3: BCTs and UAs have no standard operating procedures (SOPs) for “by-mission-type” terrain products.

Recommendation: Develop SOPs so that geospatial teams know exactly what products they must produce for certain mission types. Figure 3 provides a list of terrain products for the SOSO missions alluded to earlier in these notes.

Raid on Paramilitary Camps

- Overhead imagery to identify infiltration routes into the camps (see Figure 4).
- Perspective views of the proposed routes.
- Line-of-sight analysis from the enemy and friendly force locations.
- Line-of-sight analysis for Long Range Advanced Scout Surveillance System (LRAS3).

Cordon and Search/Knock/Attack

- Overhead imagery to identify routes into towns/cities.
- Perspective views of critical terrain surrounding towns/cities.
- Town layout and identification of key buildings (see Figure 5).

MSR Reconnaissance and Clearance

- MCOO (see Figure 1, page 37).
- Overhead imagery to clearly identify all routes connected to main supply routes (MSRs).
- Route visibility plots focusing on defile areas along the MSRs (see Figure 6).
- Gap-crossing products.

Miscellaneous

- Subterranean infrastructure (caves and tunnels).
- Water and electrical lines.

Figure 3. Geospatial Team SOP for SOSO Missions

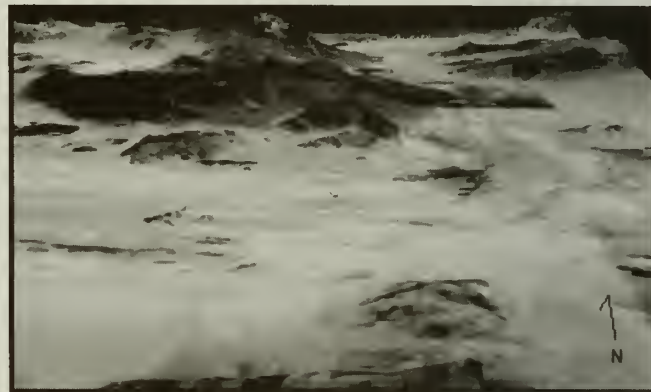


Figure 4. Perspective View of Terrain Surrounding Paramilitary Camp



Figure 5. Overhead Imagery of Urban Terrain Displaying Layout of Infrastructure

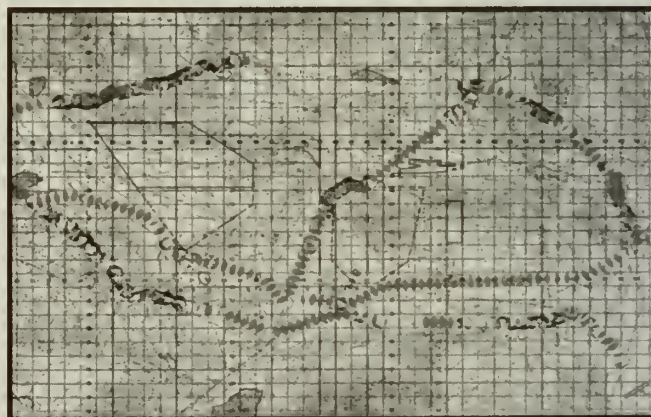


Figure 6. Route/Visibility Plot Along MSRs

Summary

With the ever-changing COE, it is more critical now than ever that geospatial teams are trained and capable of enabling commanders and staffs to see the terrain. Through proper training on the DTSS, integration with brigade and UA staffs, and development of SOPs, geospatial teams can provide relevant input into SOSO or combat operations.

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THE MARAUDERS:

A SMALL-SCALE JOINT AND MULTINATIONAL OPERATION

By Major Ted Read

Fort Leonard Wood, Missouri, is the home of the Army's Engineer, Military Police, and Chemical Branches, and it is also home to a championship rugby side (team). The Fort Leonard Wood Rugby Football Club—the Marauders—is the 2003 Missouri Rugby Football Union Division III Champion, and on 14-15 May, the club became the Western Region runner-up. The Marauders have earned the Missouri Rugby Football Union a No. 2 seed in next year's Western Region Division Championship Tournament.

These are outstanding accomplishments for a military side. The Marauders are one of the smallest (in weight) and most mature (in player age) clubs in Missouri and definitely the smallest and oldest club with a large portion of first-time players in the Western Region Division III Tournament. In short, the club is old and slow, but also young (inexperienced) and skinny. Despite this, it went on to win in Division III and played in one of only seven regional championship matches in the nation. The club's success comes from technique, teamwork, and a large dose of heart.

The Fort Leonard Wood international community contributes greatly to the club's success by assisting with the development of techniques, thorough up-to-date drills, and practices. There are Australian, New Zealand, British, Canadian, and American players, as well as family members and supporters of the side. The club's president is a British colonel who has played on the English National 7s. Last year's vice president was a British military police major, and the club's on-field captains in the Western Region Division championship game were a major from Australia and a warrant officer from New Zealand. In short, the club is a minicoalition that puts aside national and personal differences to share sweat, pain, and blood in the middle of Missouri.

The team is living proof that joint and allied interdependence is, in the micro, a reality. Both the American and international players, as well as the coaches, have put aside branch and service baggage to attain a higher goal. The team is truly a combined arms outfit, with engineer, military police, chemical, medical, aviation, and judge advocate (No, he is not



2003 Missouri Rugby Football Union Division III Champions

on retainer!) soldiers on the rolls. The team is also joint—with Army, Marine, and Coast Guard members. The team relies on everyone's blended backgrounds to ensure success.

Nothing in America can be done without community support. The mid-Missouri area has contributed greatly to the club in both financial and moral support. The club has sponsors and supporters from Rolla in the east, Springfield in the west, Lake Ozark in the north, and St. Robert in the south. All of the players, coaches, and family members send a heartfelt "thank you" to the community for all it does, not only for the club but for all soldiers in general.

The greatest attribute of the team is its heart and spirit. One of our members—a 60-year-old man who has battled throat cancer—puts every ounce of his energy into the time he is on the pitch (field). When he steps onto the pitch, it completely changes the complexion of the games. No pain is felt by the Fort Leonard Wood side, because he feels more pain walking up the stairs than the rest of the club does after a three-match (game) day. To commemorate this "fire," the club has created an award that bears his name—the "heart" award. You can see the award in the club's trophy case on the second floor of Lincoln Hall, at the Maneuver Support Center, Fort Leonard Wood.

The magnitude of this award can be seen in this year's recipient. Early in the season, one of the players was in a terrible automobile accident that he miraculously survived. However, he was told that he would not get out of the hospital for months and would probably never walk again. But he

2004 Western Region Runner-Up Team

surprised everyone 6 weeks later when he willed himself, his body, and his walker across a quarter mile of uneven terrain to be on the sideline at an away game in St. Louis. Three months later, he walked completely unassisted to watch the club's last home match. Three weeks after that, the Army could not keep him away from his job teaching soldiers how to fight, win, and survive to fight again on the battlefield. The club's players and supporters have nothing but admiration for these two phenomenal people. They are an inspiration to all of us.

Even though the club is old, inexperienced, small, and from a patchwork of disciplines and nationalities, it has a reputation of being tough, gritty, aggressive, and team-driven. It also has a reputation of being a well-rounded side where no grudges are kept and both sides meet afterward for an outstanding meal (from one of our sponsors) and a drink or two to ensure that the brotherhood of rugby (players, supporters, and family) lives on. The key to this positive reputation in the rugby and Ozark communities is heart. Heart comes in all shapes and sizes and in all nationalities. Fort Leonard Wood has that heart, which comes from the community—civilian and military, international and American—and it has a tough and disciplined rugby club to prove it.

Major Read is an instructor/writer in the Department of Instruction, U.S. Army Engineer School, Fort Leonard Wood, Missouri. He was previously an engineer observer/controller at the Combat Maneuver Training Center, Hohenfels, Germany, and commanded Charlie Company, 9th Engineer Battalion, 1st Infantry Division, in Schweinfurt, Germany. He has deployed to operations in Somalia, Haiti, the Balkans, and Afghanistan.



Phase Play Against a Galveston Team

Is the Flag "Backwards" on Soldiers' Sleeves?

By Ms. Lisa Burgess

Why do American soldiers wear the U.S. flag insignia "backwards" on the right shoulder of their utility uniforms, with the canton (the rectangle with the stars) on the observer's right? It's a question that soldiers hear frequently as they travel through civilian airports or talk to members of other services. And it does look "wrong" because U.S. federal code calls for the canton always to be positioned to the left.

The soldiers aren't wrong, however, and neither are their tailors. The Army has two authorized flag patches, one to be worn on the left shoulder, with the canton facing left, and another "reverse field" patch worn on the right shoulder, with the canton facing right. The two different orientations are mandated because Army regulations call for the flag "to be worn so that to observers, it looks as if the flag is flying against a breeze."

What does a stiff wind have to do with this custom? The rule is a nod to the U.S. Army's early history, when wars were fought as a series of carefully choreographed battles, with two armies meeting on a field, clashing head-on until one side emerged victorious. In those battles, infantry and mounted cavalry units would always designate one soldier as "standard bearer" to carry the colors into the fight. As the standard bearer charged, his rapid forward movement would cause the flag to stream back. And since the Stars and Stripes is mounted with the canton next to the pole, that section would always be forward.



So if a soldier were charging into battle, the flag would give the appearance of forward motion. When worn on the right shoulder, the flag only appears to be backwards. And that's why soldiers wear the flag patches on the right shoulder backwards. Because retreat in battle, as any soldier will tell you, is not the Army way.



Ms. Burgess began her career in journalism in 1985 after graduating from the University of Chicago. She joined the Pentagon press pool in 1989, covering national defense topics for a variety of publications before joining Stars and Stripes in 2001. Ms. Burgess has a master's in national security strategy from the National War College and has twice been named as a Freedom Forum Fellow.

(Note: A variation of this article was printed in the 28 February 2004 European edition of *Stars and Stripes*.)

(Note: A change to Army Regulation 670-1, *Wear and Appearance of Army Uniforms and Insignia*, dated 5 September 2003, instructs all soldiers, regardless of deployment status, to permanently wear the U.S. flag insignia on utility uniforms. This includes battle dress uniforms [BDUs], desert BDUs [DBDUs], maternity BDUs, cold weather coats, air crew BDUs, and combat vehicle crewman [CVC] uniforms and jackets [cold weather]. The mandatory wear date is 1 October 2005.)

Environmental Compliance Officer Course

Twenty-five officers and noncommissioned officers (NCOs) of the 2d Infantry Division attended the first Environmental Compliance Officer (ECO) Course on the Korean Peninsula from 3-7 May at Camp Casey. Personnel from the Directorate of Environmental Integration at Fort Leonard Wood, Missouri, assisted the training management NCO with the development and instruction of this 40-hour Korea-specific course. Students learned to conduct environmental awareness training, perform self-assessments and environmental risk assessments, and coordinate with the installation environmental staff for assistance. Members of

the Area 1 Environmental Office, Camp Casey Safety Office, HAZMART (handles hazardous materials disposition), Korea Regional Office (KORO) (U.S. Army), Center for Health Promotion and Preventive Medicine (CHPPM), 8th Army, provided briefings on their respective programs that relate to the environment. Army Regulation 200-1, *Environmental Protection and Enhancement*, states that commanders will appoint and train ECOs at appropriate levels to ensure compliance with environmental regulations. The Directorate of Environmental Integration can help installations develop an ECO course or other environmental training needs. For more information, contact Mr. Mike Walker at (573) 563-4119 or <walkerm@wood.army.mil>.



2d Engineer Battalion: A view of Camp No. 1, Dogan's Farm Division Headquarters, Manassas, Virginia, September 1904.
Photo courtesy of the U.S. Army Engineer School History Office.

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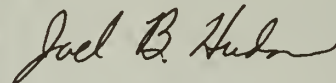
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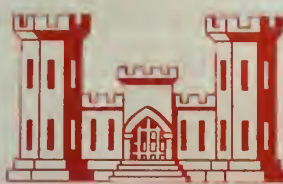
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The Soldier's Creed



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Clear The Way

By Major General R.L. Van Antwerp
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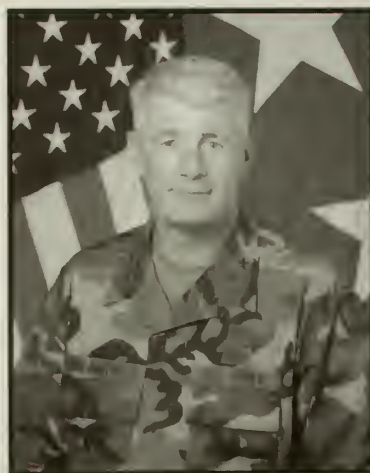
Greetings once again from Fort Leonard Wood. Our stay here was extended a few months, and Paula and I are thankful for the extra time with the Soldiers here at the home of the Engineer Regiment. We will give it our best for as long as the Army wants us to be here. We talk often about Soldiers needing to be agile and adaptive, and now we get a chance to model it. Major General Randy Castro and his wife Judy are ready to go as soon as our change-of-command date is approved. Randy is assigned as Acting Commander of Accessions Command until the changeover.

Congratulations to all you sappers now authorized to wear the tab and to our Regimental Command Sergeant Major for this great achievement in recognition. I'll let him tell you the details, but I couldn't be prouder.

For you new commanders who haven't had a chance to hear me talk about priorities, here goes: support for the war; initial-entry training—the top priority in training (meet the standards, and fully resource it); training and leader development—all initial military training; recruiting and retaining the force; transformation; and joint relationships.

If you have any questions about these or other areas within the Regiment, send your requests and questions here, and we will work the issues. You will see some new names on the Fort Leonard Wood team in this issue, and they come ready to contribute to the fight. My philosophy is that we need to continually work the mission and resources to find the balance and to get the “walnuts” done first and well. Where we have resource issues, we will make decisions in light of the priorities. I would rather “do less with less, but do it much better” than “do more with less.” Sticking to excellence in basic fundamentals proves its worth in our training base as well as it does in our units.

The Army is changing, and many of you are in the midst of this change. I want to share some of my thoughts with you about this time in our Regiment. It's clear that this is the right time to change our Army and get positioned for the future—the resources, the focus, and the support enabling change are all in place. The sense is that it will take the next couple of years to get the big pieces in place. At the same time, we are incorporating as much as we can from the Future Force template into today's force.



It's exciting to see the direction the Army is going. We are well on our way to increasing the number of Brigade Combat Teams to 43 in the Active Component. We are on our way toward growing the active force by 30,000 Soldiers, a job that will require all of us to be recruiters and retainers—a very important job. The Army is moving in the right direction to make today's force more ready for tomorrow's challenges. We are growing the Army and paying for it out of go-to-war dollars. If we have to increase the end strength even more we will, but that means we have to recruit it and train it.

Dr. Lenny Wong has written an article on “agile and adaptive” leaders and what the war has done to build these characteristics into our junior leaders. You can find a link to it on the Engineer School Web site at <http://www.wood.army.mil/eschool>. Our challenge here at Fort Leonard Wood is to make sure our young leaders and Soldiers don't lose sight of what's key to success. We are looking at ways to empower them and allow them to retain ownership for their education and actions.

We are also working to build the “go-to-war and sustain-ourselves-during-war” mentality. In our initial-entry training environment, we need to get rid of administrative time-outs when we are going to the field and practice what our Soldiers are experiencing when deployed. We will work improvised explosive devices (IEDs) into the field scenarios as much as possible. Convoys need to train like combat patrols because that is what they have become. Every movement on the battlefield is a combat operation. I ask you to remember this in your training exercises at home station and our combat training centers as well. As we incorporate the 40 warrior tasks and 9 battle drills into our standardized training here, we keep one statistic in mind: approximately half of the casualties in Operation Iraqi Freedom are 21 years old or younger. Many were Soldiers trained in initial-entry training last year. We need to constantly reinforce what right looks like, incorporating “values” into training.

VOTE! The Army voice is important, so please work hard to get everyone in a position to vote—either in person or by absentee ballot.

As I close, I am honored to remember the engineer Soldiers we have lost. God bless you all.

Specialist Joshua Bunch

Private First Class Samuel Brown

Private First Class Ryan Martin

First Lieutenant Charles Wilkins III

91st Engineer Battalion, 1st Cavalry Division, Fort Hood, Texas

216th Engineer Battalion, Hamilton, Ohio

216th Engineer Battalion, Hamilton, Ohio

216th Engineer Battalion, Hamilton, Ohio

Lead The Way

By Command Sergeant Major Clinton J. Pearson
US Army Engineer School



It has been a very productive and busy quarter for our Regiment, our Army, and our Soldiers serving our nation at war around the world. Proof of this was seen during a recent visit to the 2d Infantry Division sappers in Korea (Engineer Brigade, 44th Engineer Battalion, 2d Engineer Battalion, 82d Combat Support Equipment Company, 50th Engineer Company, US Forces Korea Engineer Command, 33d and 85th Engineer Detachments [Terrain]). They're doing a fantastic job, especially those preparing to deploy to Iraq.

Additional proof of outstanding work was evident during the Commandant's VTC on 5 August when the Engineer School leadership heard issues from the command teams of most of our deployed units as well as those that are preparing to deploy. As a result of this VTC, there are many issues that we are working, and I'd like to address the most pressing ones: approval of the sapper leader tab, the Sapper Leader Course, and the Urban Mobility Breachers Course. Another important issue, the Noncommissioned Officer Education System (NCOES) Structure Redesign (from a four-tier to a three-tier system), is discussed on page 8. It is my pledge to ensure that we continue to provide first-class training to a first-class NCO Corps.

The Chief of Staff of the Army approved the creation of the sapper leader tab on 28 June 2004. The policy should be incorporated into the next revision of Army Regulation (AR) 600-8-22, *Military Awards*, and AR 670-1, *Wear and Appearance of Army Uniforms and Insignia*, as appropriate, hopefully within the next 90 days. The tab may be awarded retroactively to any person who successfully completed the Sapper Leader Course after June 1985. Soldiers who obtain a minimum of 700 points are considered a graduate of the course and are authorized to wear the tab.

For officers and NCOs interested in earning their sapper leader tab, there are many options available to attend the course. Select Engineer Officer Basic Course students with follow-on assignments to light units will have the opportunity to attend the course immediately following graduation. A new initiative will soon allow NCOs in the Basic Noncommissioned Officer Course (BNCOC)/Advanced Noncommissioned Officer Course (ANCOC) to attend the course immediately upon graduation, with chain-of-command approval. Soldiers identified to attend must be input into the Army Training Requirements and Resources System (ATRRS) in order to be authorized to remain here at Fort Leonard Wood an additional 25 days following graduation from BNCOC/ANCOC. This can be done at the unit level prior to the beginning of school, or it can be done here at Fort Leonard Wood with the assistance of the NCO Academy



leadership. Those who are deployed in support of the war can attend in a TDY status when redeployed, with chain-of-command approval. As you can see, all options present additional opportunities for professional development, as well as allow the Army greater opportunity to educate, train, and prepare leaders to succeed if called upon to execute specialized sapper skills. By the way, let me remind you that during ENFORCE, we announced the first "Best Sapper Competition," which will kick off in April 2005. I challenge you to send the best of the best for this super competition!

I also challenge you to take advantage of another initiative positively affecting the Engineer Regiment's NCOES. Select NCOs are now being afforded the opportunity to attend the

Urban Mobility Breachers Course, conducted by the US Marine Corps Engineer School at Camp LeJeune, North Carolina. We have selected two NCOs from the 588th Engineer Battalion, 4th Infantry Division, and one NCO from the 307th Engineer Battalion, 82d Airborne Division, to attend Class 01-04 on 4-26 October 2004. Upon graduation, they will be reassigned to Fort Leonard Wood, with duty at Camp LeJeune. These NCOs will serve as Interservice Training Review Organization (ITRO) instructors, augmenting the training of Army personnel attending the course. All class dates have been loaded in ATRRS, with the next class scheduled for 31 January-18 February 2005. We have 15 slots per class, as requested by units. The course will consist of 120 hours of in-depth explosive theories, urban reconnaissance, employment of urban breaching assets—including explosive, manual, and ballistic breaching techniques for urban operations—and use of Current Force equipment. To attend this course, you must meet the requirements in DA Pam 611-21, *Military Occupational Classification and Structure*, and AR 600-9, *The Army Weight Control Program*; be a combat engineer in grade E-5 (P) through E-7 and a graduate of combat engineer BNCOC; have no pending Uniform Code of Military Justice (UCMJ) actions and no limiting profile.

It's important that everyone accept and adapt to these changes. Today's Army is very different from yesterday's Army. Change is essential to survival. As the Chief of Staff of the Army insists, "We have to [change] some of the things that made us the best Army in the world...but everything else is on the table." Subsequently, we must reconsider and challenge our most deep-seated institutional practices to better serve our Army and our nation. This means retaining practices that make sense and implementing initiatives where necessary to increase our ability to successfully respond in today's Army. Essayons!



Assured Mobility in the Army's First Stryker Brigade

By Major Heath C. Roscoe and Captain Kenneth Dean Mitchell

The 3d Brigade, 2d Infantry Division, the Army's first Stryker Brigade Combat Team (SBCT), deployed from its home station in November 2003 for Operation Iraqi Freedom. After training at Camp Udairi, Kuwait, the brigade moved into Iraq and conducted combat operations in the Salah al-Din province (Ad Duluiyah, Balad, and Samarra), located in the Sunni Triangle, and later moved north to the Ninevah province (Mosul and Tall Afar). Due to the complex nature of the conflict in Iraq, the brigade is conducting stability operations and support operations concurrently with combat operations. The enemy's ability to affect mobility with the use of improvised explosive devices (IEDs) was anticipated. With the organic and attached engineer units and the assured

mobility framework, the brigade has been able to effectively deal with the IED threat to its mobility in the city of Mosul.

Engineers in the SBCT

The engineers in the SBCT are a large part of assuring its mobility. Engineers organic to the SBCT are the Brigade Engineer Section and the 18th Engineer Company, while the 276th Engineer Battalion (Corps) (Wheeled) and the 744th Explosive Ordnance Disposal (EOD) Company are attached for general support.

Brigade Engineer Section

The Brigade Engineer Section consists of an operations/planning cell and a brigade terrain team. The cell integrates all of the engineer battlefield functions (mobility, survivability [force protection], countermobility, topographic engineering, and general engineering). The terrain team provides standard and nonstandard terrain products and tactical decision-making aids. These products, critical to the targeting process, help commanders at all levels visualize the terrain and assist them in making decisions on the employment of SBCT assets.

18th Engineer Company

The primary focus of the 18th Engineer Company is tactical mobility. It consists of a headquarters section, three mobility platoons, and a mobility support platoon. Its mission is to detect and prevent emplacement of IEDs by patrolling the main routes in the city of Mosul. The engineer anti-IED patrol is a platoon mission. The



An ESV with slat armor

mobility platoons have a full complement of necessary engineering equipment, with the engineer squad vehicle (ESV) at the center. However, platoon leaders in the company currently have up-armored, high-mobility multipurpose wheeled vehicles (HMMWVs) instead of ESVs. The brigade is working through the Department of the Army Review Team process to add ESVs to the mobility platoon leader position. The engineer anti-IED patrol will soon receive new systems to prevent remote detonation of IEDs, and new equipment training for these systems is currently being conducted. Since IEDs seem to be the weapon of choice for the enemy, modification of the ESV to add the counter-remote-controlled IED is important.

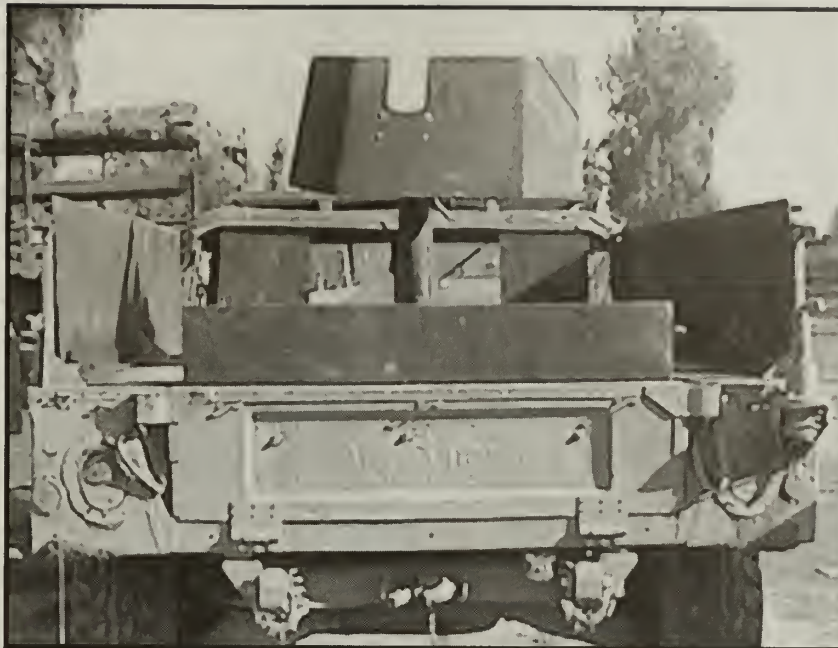
276th Engineer Battalion and 744th EOD Company

The primary focus of the 276th Engineer Battalion is supporting the maneuver battalions with mobility, survivability, and general engineering. The brigade has task-organized sapper platoons in a direct-support role to all five maneuver battalions. This provides an engineer reserve to respond to priority force protection projects. The 276th uses the Meerkat and Husky to detect and neutralize mines and IED threats in remote sectors of the area of operations. The company also provides the 744th EOD Company with mobility and security while responding to IEDs and caches throughout Mosul. An IED response force and a cache response force for the brigade consists of a platoon from the 276th and an EOD team. The cache response force has the haul capability required for large finds of captured enemy ammunition or arms.

Assured Mobility in Action

Assured mobility encompasses those actions that give the force commander the ability to deploy, move, and maneuver where and when desired, without interruption or delay, to achieve the mission. The imperatives and fundamentals of assured mobility are a relatively new doctrinal framework. These fundamentals enable friendly forces to exploit superior situational awareness and situational understanding, gaining unsurpassed freedom of movement. This framework describes the processes that enable the commander to *see first, understand first, act first, and finish decisively*.¹ The six fundamentals of assured mobility are—

- **Predict**—predict the ability of the enemy to impact maneuver.
- **Detect**—use intelligence, surveillance, and reconnaissance (ISR) assets to identify the emplacement and location of obstacles. ISR assets can also be used to identify solutions and alternate courses of action.
- **Prevent**—act early to prevent obstacles from affecting maneuver.



A HMMWV with a steel ballistic shield

- **Avoid**—choose alternate routes to avoid the obstacle.
- **Neutralize**—reduce the obstacle if avoidance is not possible.
- **Protect**—protect soldiers, equipment, and the mission from enemy countermobility effects.

Predict

Prediction is a function of brigade-level staff action, coordination, and analysis. The brigade engineer, along with the S2, must accurately predict potential enemy impediments to mobility. They analyze the enemy's countermobility capability and effects. The primary method used to impede mobility in Iraq is the IED. Materials for IEDs are readily available throughout the country, and anti-Iraqi forces train resistance elements in the construction and employment of IEDs. The purpose of IEDs is to kill or wound US and coalition soldiers and destroy vehicles. A secondary effect is that the route must be closed while an IED is properly neutralized, which disrupts civilian and military traffic. In a city of 1.8 million people, stopping traffic on a main route has major effects.

The brigade staff works to understand the enemy's tactics, techniques, and procedures; capability; and evolution in order to understand the effects it can have on mobility. The 101st Airborne Division (Air Assault) kept records of IED incidents since its arrival in June 2003, and the SBCT continued this historical data. The brigade engineer, along with the S2, analyzed the data and predicted the most likely emplacement times and locations. Using this data, the staff was able to coordinate the engineer effort, ISR collection activity, and maneuver forces to effectively counter the threat. But the targeted areas, emplacement times, construction, and trigger mechanisms continue to change, making it imperative to continually analyze the data and alter the brigade's efforts.



Strykers roll off the boat in Kuwait

Detect

The SBCT detects explosive hazards before the enemy can inhibit mobility or cause harm to US and coalition forces. This is done using the different maneuver and ISR assets embedded in the brigade: engineer anti-IED patrols, infantry patrols, observation posts, human intelligence sources, signal intelligence sources, unmanned aerial vehicles, and the Reconnaissance, Surveillance, and Target Acquisition Squadron. SBCT engineers also provided additional training to maneuver, military police, and host nation forces to increase effectiveness in identifying and detecting IEDs. There are three phases during which an IED can be detected:

- During emplacement
- While emplaced but not detonated
- After detonation

All three have some impact on mobility and must be addressed separately.

Detection During Emplacement. The SBCT aggressively conducts anti-IED patrols with the infantry battalions and engineer anti-IED patrols during likely emplacement times identified by the brigade staff. Some areas along the routes have been identified as high risk, or named areas of interest, during the predict process. Because of coalition presence, the enemy found it difficult to prepare and set up an IED. Ordnance has been found inside suspicious vehicles stopped by anti-IED patrols and at flash tactical control points. In addition, Iraqis report suspicious activity and devices to the Iraqi police, who respond with their own civil defense EOD team. These

IEDs are detected early and prevented with an aggressive presence and human intelligence gathering. Detecting an IED during this phase has minimal impact on the mobility of the brigade.

Detection While Emplaced but not Detonated. Anti-IED patrols sometimes find partially set up IEDs. But anti-Iraqi forces are starting to produce and emplace "pop-and-drop" IEDs that significantly reduce emplacement time. The engineer anti-IED patrols use technology to their advantage. The thermal capability of the ESV, night vision goggles, and spotlights with infrared filters allow engineer soldiers to detect possible emplacement locations. The engineer anti-IED patrol varies security patrol times, routes, and direction of travel to support maneuver operations and prevent predictability. The brigade uses OH-58D helicopters and unmanned aerial vehicles to detect enemy activity in high-risk areas. Upon finding a potential IED, the Buffalo mine-protected vehicle is used to investigate with its robotic arm. When the Buffalo is not available, a Packbot or a MATILDA robot is used to confirm or deny potential IEDs. Using these devices reduces the risk to soldiers and false-alarm responses of EOD assets. When an IED is detected, the roads are closed as maneuver forces secure the area to ensure that the "triggerman" is not nearby. The IED response force then neutralizes the threat. Because the brigade can quickly transfer information through the Force XXI Battle Command-Brigade and Below (FBCB2) System, the IED does not impact mobility.

Detection After Detonation. At this phase, the IED detonates on US or coalition forces. The Stryker vehicles are remarkably tough and resilient, resulting in very little damage

to equipment or soldiers. The brigade has made an effort to protect unarmored vehicles with add-on armor kits. Depending on the operating tempo (OPTEMPO), the IED response force can conduct a post-blast analysis. If vehicles are damaged or personnel are injured, maneuver forces must close the roads temporarily and secure the site until recovery or medical assets can respond.

Prevent

To prevent enemy placement of IEDs, infantry and engineer anti-IED forces patrol continuously, especially in front of critical soft logistical convoys. Soldier competence and alertness, coupled with mounted crew-served weapons and hardening of soft-skinned vehicles, make a more aggressive and less enticing target for the enemy. Anti-Iraqi forces usually do not detonate an IED on convoys with overwhelming firepower and an aggressive stance, but will wait until a softer target comes along. Thus, the posture of a convoy is a large component of preventing the detonation of prepared and emplaced IEDs.

The SBCT also prevents IED emplacement through seizure of caches throughout the city and securing critical ammunition supply points within the area of operations. Reducing the amount of ordnance available to bomb makers is a key component of prevention.

Finally, and most importantly, preventing the enemy from impeding mobility in the first place requires successful targeting. The best way to prevent IEDs is to capture or kill the bomb makers. ISR assets are tasked and focused on gathering intelligence on these high-payoff targets. An entire enemy IED cell was captured in early March, which was followed by a significant decrease in IEDs for a while. The institutional knowledge to construct the devices and emplace them was lost. However, those caught are soon replaced by others, and the brigade must continue to aggressively target these individuals.

Avoid

A route-status tracker is used to inform higher and subordinate elements on the threat conditions for the routes in the area of operations. This tracker, an element of the common operational picture (COP), is updated daily and briefed to the commander. This tool is used to plan and execute convoys and combat missions and avoid areas with IEDs. When an IED is identified or detonated, it is immediately reported to the brigade tactical operations center. The unit reporting the IED sends a contact report that contains critical IED information and a

request for EOD support. The unit also populates the FBCB2 System with the location of the IED and blocked locations along the route, allowing military units and convoys to avoid the hazard. All brigade convoys patrol with an operational FBCB2 System. With the superior situational awareness and situational understanding given by the digital systems and the COP, units see the threat in real time and are able to avoid the affected area, thereby limiting the IED impact on brigade mobility.

Neutralize

Because Mosul is a large city and traffic is already severely congested, it is important to remove the hazard as soon as possible and get civilian traffic moving again. The SBCT created the IED response force for this reason. Its task and purpose is to neutralize IEDs as soon and as safely as possible to allow unrestricted movement of combat forces. The unit that finds an IED or the maneuver unit that owns the battlespace secures the site and keeps civilians and other military traffic away from the hazard area. Once the IED response force arrives, it makes a quick assessment, neutralizes the hazard, and reopens the route. Iraqi police, in conjunction with the local civil defense EOD team, responds to IEDs reported by Iraqis and only requests US EOD support if the IED is beyond their capability. This host nation's capability greatly reduces the OPTEMPO of brigade EOD forces.

The 744th and 276th did not come to the brigade equipped with digital systems, so they had no means to see the brigade COP and react in real time to incidents. This ability speeds up response time and allows them to avoid threats en route to a mission. The brigade reallocated FBCB2 Systems from organic SBCT vehicles to give them this capability; however, non-equipped forces should be fielded with compatible digital systems.



The Buffalo mine-protected vehicle

Protect

Protecting the brigade soldiers from the effects of IEDs has been a priority of the commander since Day One. The force modernization cell from the brigade has aggressively pursued ways to add force protection to brigade soft-skinned vehicles. The Army has come up with excellent kits for this purpose. But until these kits flow to the units, they must look for interim fixes by purchasing steel and Kevlar® blankets.

The equipment given to soldiers has improved as well. Ballistic eye protection, small arms protective insert (SAPI) plates, hatch operator gloves, knee and elbow pads, advance combat helmets, and medical battle packs are in the possession of each soldier. Items at the squad and higher levels include ratchet-type tourniquets, SKEDCO litters, Israeli litters, "jaws of life" extraction tools, combat lifesaver bags at the fire team level, intrasquad radios, and modular integrated communication headsets that filter out noise and prevent hearing loss. These items have all provided protection to soldiers during IED incidents. The SBCT continues to look for additional commercial, off-the-shelf technology to increase vehicle force protection and soldier survivability.

Conclusion

Assured mobility is a proactive process that, instead of reacting to the enemy, allows us to predict, detect, prevent, avoid, neutralize, and protect. This process requires the brigade staff and all units to conduct detailed planning—incorporating the assured mobility fundamentals—to ensure that our soldiers remain safe and the mission is accomplished according to the commander's intent.



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Captain Mitchell is the Commander, 18th Engineer Company, 3d Brigade, 2d Infantry Division (SBCT), deployed in support of Operation Iraqi Freedom. His past assignments include assistant brigade engineer, 3d Brigade, 2d Infantry Division (SBCT), and assignments at the 864th Engineer Battalion (Combat) (Heavy) and the 37th Engineer Battalion (Combat) (Airborne). Captain Mitchell holds a master's in structural engineering from Stanford University.

Endnote

¹Field Manual 3-34, *Engineer Operations*, 2 January 2004, Chapter 3, Section II, paragraph 3-40, page 3-11.

Noncommissioned Officer Education System Structure Redesign

By Command Sergeant Major Clinton J. Pearson

Today's Noncommissioned Officer Education System (NCOES) is a four-tiered, rigid, task-based system designed around a *Select-Train-Promote* model, instead of preparing NCOs for a wide range of assignments and missions that are encountered on today's battlefield. With recent modernization and transformation efforts, the need to redesign our NCOES is obvious. We must meet the requirements of leaders in full-spectrum operations, align the critical developmental transition points in a leader's career with the Army's assignment process, supplement force stability initiatives, and incorporate a system that operates in concert with a modular force. The NCOES must remain focused on core areas—including leading, training, maintaining standards, caring for Soldiers, technical competencies, and tactical warrior skills—while integrating additional training on conceptual and interpersonal skills.

Modernization efforts are being coordinated with the Center for Army Leadership (CAL), using a two-phased approach. Phase I consists of near-term changes affecting current Basic Noncommissioned Officer Course (BNCOC)/Advanced Noncommissioned Officer Course (ANCOC) classes. Phase II consists of shifting from the current four-tiered system to the new three-tiered system. It focuses on leadership development and the Warrior Ethos, keeping the responsibility of teaching technical skills with proponent schools/centers, and is not an integral component of the common core.

Tier 1, the Warrior Leaders Course (WLC), is for all E-4s with promotion potential. This course trains specialists to be NCOs and focuses on leading, training, maintaining standards, caring for soldiers, and tactical warrior skills. The WLC prepares Soldiers for assignments in teams, crews, and squads. Potentially, graduating Soldiers will be laterally transferred to corporal upon graduation. Only corporals are eligible for recommendation to sergeant.

Tier 2, the Intermediate Leaders Course (ILC), is for E-6s with promotion potential. This course is non-military occupational specialty (MOS) specific and trains the staff sergeant in skills requisite for all MOSs. It prepares individuals to be the primary trainers, operating in a platoon and company environment. Course completion is a prerequisite for consideration for promotion selection to sergeant first class.

Tier 3, the Senior Leaders Course (SLC), is for promotable E-7s, E-8s, and sister service E-8 equivalents. This course replaces the Sergeants Major Course (SMC) in its present form and will prepare master sergeants to function within battalions, brigade combat teams, and unit of employment (UE) organizations. Completion of this course is a prerequisite for promotion to sergeant major.



Engineer Battalion Headquarters Company Operations

By Captain Jerry McDaniel

Operation Iraqi Freedom has provided many opportunities for soldiers and units, from all military specialties, to operate outside of their normal lanes. Engineers soon learned that they had to adapt to emerging doctrine, assuming roles and missions not normally envisioned and learning to function as engineer teams and task forces. Even headquarters elements, such as Headquarters and Support Company (HSC), 203d Engineer Battalion (Combat) (Heavy), had to adapt to the new environment. HSC, 203d—a Missouri Army National Guard unit based in Joplin, Neosho, and Fort Leonard Wood, Missouri—deployed to Iraq in May 2003, serving there until early July 2004. Initially assigned to the 130th Engineer Brigade, the 203d was later attached to the 493d Engineer Brigade, 1st Armored Division, an Army Reserve unit from Dallas, Texas, whose area of operation was the greater Baghdad area.

Missions

The HSC mission was to provide personnel, operations, supply, food service, communications, medical maintenance, and heavy equipment support to the rest of the 203d. In addition to being involved in almost every task

assigned to the battalion, HSC was often deployed as a fourth maneuver element and undertook combat operations normally assigned to a combat engineer unit rather than a construction unit.

Support Missions

Within 48 hours of arrival, and during base camp construction, the company was on support missions in the city: the Baghdad Zoo reopening, trash cleanup, and an ongoing series of force protection and quality-of-life improvements for the units located in the Baghdad International Airport (BIAP) area. These support missions included removing tons of scrap metal; placing hundreds of yards of HESCO Bastion Container® walls; hauling gravel for unit motor pools; hauling away Iraqi missiles for destruction; and clearing trees, brush, and buildings away from the main road leading to the airport. Equipment operators also cleared trees to improve fields of fire and dug fighting positions for the armored vehicles guarding the airport. During these missions, HSC soldiers logged thousands of miles in Baghdad traffic—largely without assistance from combat units. They provided most of their own security during convoys and jobsite security missions as well.



Soldiers from the 203d and Army firefighters work at the bombed United Nations building in Baghdad.



Equipment from the 203d is used to demolish buildings along an alternate supply route.

Construction Missions

As the Army leadership in Baghdad began to develop a deeper sense of what needed to be accomplished, the mission load for the engineers increased. In addition to the many small projects the battalion completed, several major missions were undertaken. These included construction of the West BIAP Camp, the Butler Range Complex, Camp Falcon, Camp Muleskinner, and Camp Victory, as well as Camp War Eagle and Camp Dragoon. HSC soldiers—whether equipment operators, surveyors, mechanics, or medics—had a hand in all of these major projects.

West BIAP Camp. This camp was the original home for the forces at BIAP, and the 203d was a major player in the establishment of the camp facilities. The battalion engineer officers were key planners in the development of the base, and the HSC survey section had the lead in developing the base camp survey plan and the supporting road network. The camp was later named Base Neusche, in honor of Specialist Joshua Neusche, an outstanding young HSC soldier who died early in the deployment.

Butler Range Complex. Located on a former Iraqi army installation, this complex was designed to allow 1st Armored Division to train on its weapons and maintain its combat skills. The 203d operations staff completed the design and material requirements. Engineers from across the battalion worked to construct the temporary living area, wooden barracks, earth berms, roads, and range facilities. The supply, food service, and medical sections provided support to the soldiers engaged in the construction. Later, HSC soldiers improved their own skills by training at the site. Convoy defense live-fire and

machine gun qualifications were conducted on the ranges. HSC equipment operators supported the 16th Engineer Battalion (Armored) in training exercises by digging and breaching defenses and fighting positions and participating in live-fire exercises.

Camp Falcon. As the mission load began to increase, HSC was tasked as a de facto fourth line company, assigned to handle operations in the southwest area of Baghdad. Camp Falcon was the home of the 2d Brigade, 82d Airborne Division. After completing the initial work assessment, the HSC equipment platoon was assigned the project lead. The mission, which started with the construction of two helicopter pads, soon turned into one of the largest base camp projects in Baghdad. After constructing the helicopter pads, the platoon hauled gravel and completed the motor pools within the camp. As the camp expanded, the platoon built roads for civilian vehicle traffic and access around the camp perimeter. The project included clearing and placing gravel for a soldier living area and

removing piles of construction debris along a 2-mile stretch of highway. When Bravo Company was later tasked to assume the operation, the project had expanded to include substantial vertical construction as well. Bravo Company engineers continued with extensive earthwork, constructed four wooden buildings, and oversaw Iraqi contractors on the construction of twelve concrete and brick barracks and a perimeter wall.

Camp Muleskinner. Designated as one of the primary base camps in Baghdad, HSC equipment platoon members were the first to arrive on-site. They bulldozed run-down buildings, placed protective berms around the camp, cleared fields of fire and observation for the camp defenses, and surveyed facilities for the establishment of a training site. After HSC completed several projects, Charlie Company was selected to lead the camp expansion. Charlie Company soldiers completed earthwork and force protection projects, renovated several buildings, and supervised Iraqi contractors on the construction of concrete and brick barracks.

Camp Victory. When the primary Baghdad camp moved from West BIAP, HSC soldiers surveyed an area that was later known as Camp Victory North. The battalion survey team directed surveyors from several units in establishing the baseline survey for the camp. Battalion staff members were key players in the camp development, laying out locations for housing units, motor pools, and roads. Parking lots, housing areas, and roads were soon cleared and constructed. The HSC concrete and dump truck sections supported the line companies, pouring concrete for building slabs and hauling gravel for life support areas and motor pools.



A 203d soldier helps Iraqi civilians remove debris from a refugee camp.

Heavy Equipment Missions

Several of the missions assigned were unusual for a construction unit, especially for a headquarters element. Shortly after arriving in theater, HSC used armored D9 bulldozers to destroy several buildings in an old Republican Guard compound along a supply route. Enemy forces hid out in these buildings to ambush convoys moving along the highway. Infantry support was not available, and military police assets were limited. The equipment platoon, supported by maintenance and medical personnel, moved to the site and deployed as an infantry force. They cleared and secured the buildings, then looked for mines and booby traps in the area. Once secured, construction equipment was brought in to clear several buildings, along with abandoned Iraqi fighting positions. Trees and brush were also cleared along the highway.

Another building demolition soon followed. Enemy forces were firing on the Baghdad South power plant, using the buildings outside the plant for cover. HSC soldiers coordinated with the security element, moved in, and demolished several of the buildings.

HSC also supported the 82d Airborne Division in raids against suspected terrorists, who used concrete and brick buildings and walls for cover and concealment. The D9 bulldozer operators were asked to assist, so they moved out with the night patrols and demolished some of the buildings and walls. With the help of the engineers, several suspected terrorists were caught during these operations.

When terrorists bombed the United Nations facility in Baghdad, HSC was tasked as the lead element for the recovery effort and was supported by Bravo Company and additional soldiers from across the battalion. The engineers loaded their



Engineer equipment was critical in the cleanup of this refugee camp.

“When terrorists bombed the United Nations facility in Baghdad, HSC was tasked as the lead element for the recovery effort and was supported by Bravo Company and additional soldiers from across the battalion.”

equipment that night and rolled out at first light. Relieving the first responders on the site, the engineers began a week-long, 24-hour-a-day mission to clear debris and then deployed rescue teams to search for survivors in the rubble. Coordinating with the Federal Bureau of Investigation, the United Nations, Turkish civil defense personnel, and Coalition Provisional Authority representatives, the 203d removed the remains of the victims, removed and buried the rubble, and provided building security and media escorts. The battalion also provided medical, maintenance, supply, and force protection support to the other forces guarding the site and to United Nations employees. HSC directed efforts to re-establish water supplies to a neighboring hospital that had been disrupted after the attack.

The most difficult and dangerous mission was supporting the 1st Armored Division in the city of Karbala. Shia Muslim insurgents had killed a US military police officer and taken over a mosque and a group of buildings in the city. US forces were sent to the city in October, and the 203d was tasked to provide D9 bulldozers and additional construction equipment to support the infantry and help clear debris. HSC received the mission, and the engineer assault team, supported by maintenance and medical personnel, traveled through miles of empty desert and linked up with the assault forces in the city. They unloaded their equipment and moved against the enemy-held buildings within minutes of arrival. The enemy, confronted with overwhelming firepower and armor-plated bulldozers, gave up without firing a shot.

The battalion also put together an emergency response team, lead by the HSC executive officer. With additional heavy equipment, dump trucks, and combat engineers attached from another battalion, the team arrived in downtown Karbala that night and linked up with the other HSC soldiers at the attack site. The operation was completed that first night, but the team remained to support further operations and assist civil affairs teams in assessing the damage before returning to Baghdad.

Even as the company prepared to redeploy, the mission to support the infantry forces continued. In April, forces loyal to Muqtada al Sadr staged an uprising. Operators from the equipment platoon were tasked to support the 1st Cavalry Division in an operation to capture one of his subordinates. Once again, the construction engineers participated in night operations against hostile forces. Over several nights, the bulldozers were at work with the infantry and tanks, clearing building rubble from the fighting in the streets of Abu Ghuraib, in spite of the danger of enemy attack.

Entry Control Point Missions

When not engaged in construction work, the HSC equipment platoon and several technical engineer specialists ran an entry control point onto the airport. The task was difficult and potentially dangerous. Iraqi contractors hauled in the gravel, sand, concrete, and asphalt used in the construction of Camp Victory, and the vehicles—sometimes more than 600 a day—and drivers had to be searched for weapons and explosives. The quality of the construction materials also had to be checked. This work was often frustrating and challenging. Most of the Iraqis were from Abu Ghuraib and Fallujah, long hotbeds of anti-American activity. It took considerable time and effort for the two sides to learn to work together. The soldiers earned the respect of the Iraqis because of their respectful but no-nonsense approach to running the operation. Many Iraqis were quick to fight each other with fists and lead pipes, so the HSC soldiers had to break up the fights, often arresting the antagonists and taking them to the local police station.

Battalion Support Missions

While the rest of the battalion was out on missions, other HSC soldiers provided the necessary support base for the battalion.

Food Service. The food service section ran operations at Base Neusche and the Butler Range Complex until the contract dining facilities were established. The section resumed operations later when the battalion deployed to Camp Duke, outside of An Najaf.

Logistics, Personnel, and Communications. In addition to the survey work, the battalion staff elements planned the logistics, personnel, and communications support for the battalion. At one point, the logistic section operated the largest construction supply yard in the city, with lumber, wire, plumbing, and roofing supplies.

Medical. The medical section provided medical support to three other engineer battalions, the engineer brigade and group, and personnel passing through the West BIAP Camp.

Maintenance. All company and battalion operations would have been impossible without the work of the HSC, and battalion operations would have been impossible without the work of the company and direct support maintenance sections. Maintenance teams deployed to the field to support every major mission. The remaining mechanics performed a wide variety of services from repairing broken belts to changing engines on construction equipment. The maintenance sections maintained the pace of operations, despite a shortage of spare parts. No mission failed due to a lack of available equipment, and equipment services were completed on or ahead of schedule.

(Continued on page 25)

Task Force Able Supporting Operation Iraqi Freedom

By Colonel Christopher J. Toomey

Deploying in support of Operation Iraqi Freedom in April 2003, the Fort Lewis-based 555th Engineer Group (the Triple Nickel) conducted extensive operations with the 4th Infantry Division's Task Force Ironhorse and ably demonstrated the versatility, flexibility, and agility of modern combat and general engineering forces as it conducted full-spectrum engineer combat operations (to include fighting as infantry). As the sole brigade-level engineer headquarters with the Force XXI-structured 4th Infantry Division, the 555th conducted echelon-above-brigade operations across the entire division area of responsibility (AOR) and was often called on to conduct security and infantry operations. This article briefly summarizes the task force's operations and presents some observations.

A Versatile Engineer Force

As a multicomponent, multifunctional unit, the 555th (known as Task Force Able) benefited from a unique variety of skills and experience. Of the six battalions eventually assigned to the group, three were active, two were Army National Guard (Mississippi and West Virginia), and one was US Army Reserve (Figure 1). Similarly, the separate companies also came from all components. This was a key developmental experience for all leaders and soldiers who had to understand and appreciate the strengths of each component. It was also a great success, because all units in Task Force

Able contributed equally to the efforts and sacrificed in the accomplishment of the mission. The achievements of the task force demonstrate that Active Component (AC)/Reserve Component (RC) integration works and is a viable reality for today's force.

In a recent letter to the editor of *Stars and Stripes*, a non-commissioned officer (NCO) from the 223d Engineer Battalion, Mississippi Army National Guard (part of Task Force Able), described his impressions of this multicomponent force:

"I don't know where the writer got the idea that reservists and guardsmen are whining about doing their jobs. I was with the 14th Engineer Battalion out of Fort Lewis. Those guys would work 24 hours if you let them, and our guys are right there with them to the end. We're all soldiers out here. There are no guardsmen and reservists. We are an 'Army of One.'"

Task Force Able was multifunctional and included combat engineers, construction engineers, and bridge builders. This assortment of units gave the task force the ability to perform just about every engineer mission imaginable, while working over the entire division AOR—in excess of 35,000 square miles—and with every brigade combat team (Figure 2, page 14). This large and diverse AOR posed some significant challenges that included long distances, inadequate infrastructure, and a determined enemy.

Lines of Operation

Within this AOR, Task Force Able operated along several main lines of operation that were based around the most common mission sets:

- Constructing power projection platforms and forward operating bases (FOBs).
- Reinforcing force protection.
- Providing assured mobility through route improvement, bridging, river patrols, and route clearance.
- Securing and destroying unexploded ordnance (UXO) and captured enemy ammunition (CEA).
- Facilitating civil infrastructure by helping Iraqis rebuild Iraq.

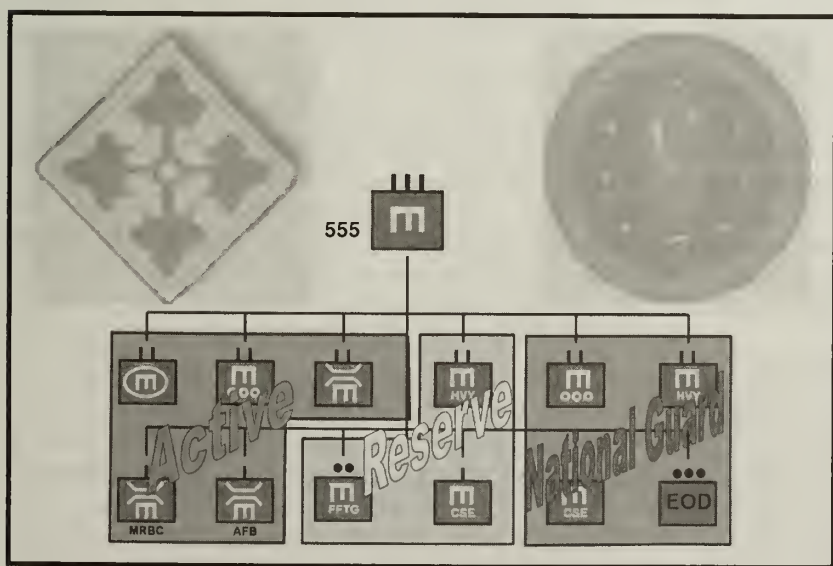


Figure 1. Task Force Able Organization



Figure 2. Area of Responsibility for the 4th Infantry Division

These lines of operation, described in general terms below, were not discrete and often overlapped. Throughout the deployment, the task force provided direct and general support to the division-committed brigade combat teams and often fought as infantry—conducting raids and ambushes and performing security operations.

Forward Operating Bases

The 555th contributed to building more than 50 FOBs for division troops. These were essential to provide relatively secure life-support areas from which units could project operations. In a harsh environment, with temperatures in excess of 140°F in the summer, these areas were important for maintaining the health and safety of the force. The FOBs varied in size from company outposts to battalion-sized bases. Each FOB included living areas, power, water, and accommodation for sewage (ranging from burnout to chemical latrines). Surface area improvement was essential. In Iraq, the ground is very unstable; the soil turns to choking dust in the summer and liquefied mud in the winter. Gravel was the primary material used for soil stabilization, and Task Force Able spread tons of gravel over thousands of square meters to provide a stable surface.

Proper force protection was a key piece of FOB development. The task force constructed bunkers and fighting positions and emplaced numerous berms and wires to secure perimeters. The task force and resident units worked diligently to harden a variety of sites on each FOB—from fighting positions and access gates to living quarters and morale, welfare, and recreation tents. The sandbag earned renewed

respect, and the units of Task Force Able used literally thousands of HESCO Bastion Concertainers®.

Force Protection

Aside from FOBs, Task Force Able's efforts extended to protecting all manner of US, coalition, and procoalition Iraqi installations. The task force constructed multiple well-developed traffic control points along major routes and emplaced protective measures for Iraqi civil infrastructure, police stations, and civil defense installations to guard against attack—particularly against the increasing threat of vehicle-borne improvised explosive devices (IEDs). Figure 3 shows some of the force protection measures employed.

Mobility Operations

A major mission for engineers—across history—is giving freedom of movement to the force by providing assured mobility. Task Force Able improved and rebuilt thousands of kilometers of road and trails. Most of the roads in Iraq are not designed to withstand sustained military traffic and required a continual program of route upgrade.

Bridging and River Patrols. Task Force Able also put in and maintained some significant bridging. The task force emplaced several military bridges over the Tigris River to provide mobility for military (both the 101st Airborne Division [Air Assault] near Mosul in the north and the 4th Infantry Division) and civilian traffic. With most significant bridges over the Tigris River destroyed during the early part of the war, it was essential to establish crossing sites. These included the longest Mabey & Johnson float bridge ever erected. Named for two soldiers from the 14th Engineer Battalion who were

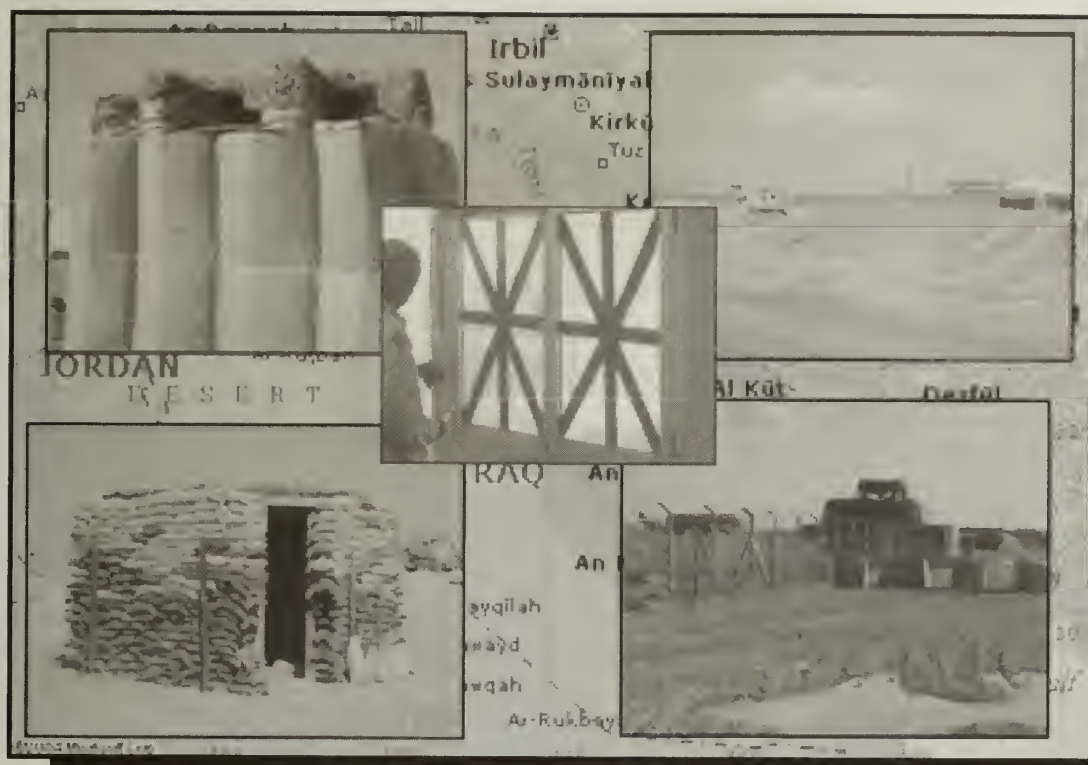


Figure 3. Force Protection Measures Used by Task Force Able

lost in the conflict, the Haight-Jordan Bridge was more than 320 meters long.

Tied to bridging was ensuring mobility along the waterways, principally the Tigris River that effectively bisected the division AOR. In a great show of flexibility, Task Force Able assumed water patrol missions using bridge erection boats as riverine patrol craft. The efforts of the task force ensured that coalition forces controlled the river and effectively denied it to the enemy.

Route Clearance. Another major combat operation for Task Force Able was route clearance. In a noncontiguous and dispersed battlefield, security and clearance of routes connecting nodes of combat power is critical. The enemy quickly seized on coalition routes—extended, exposed, and difficult to secure—as vulnerable points to launch ambushes and attacks. The preferred attack was to mine the road or use an IED to attack convoys. Starting out as simple and relatively unsophisticated explosives, the IEDs matured into deadly devices. Often, the enemy followed up IED attacks with small arms fire or rocket-propelled grenades. The attacks were fast, and the enemy seldom stayed around to be counterattacked by US forces.

To thwart these attacks, Task Force Able launched a concerted campaign of route clearance and presence to inhibit, find, and destroy IEDs and mines and those emplacing them. The task force assumed this mission with the intent to thwart the enemy's ability to emplace IEDs or mines, while capturing or killing those who did. The operation, known as Trailblazer, lasted several months and resulted in the clearing of more

than 23,000 kilometers of road and the destruction of large quantities of IEDs. Of particular help to the Trailblazer mission was the use of a new generation of mine clearing and detection devices and vehicles currently being fielded. The Buffalo—a wheeled vehicle with a camera-equipped, mine-excavating arm to allow standoff—was particularly useful. Figure 4, page 16, shows the Buffalo and the Meerkat mine detection systems.

UXO and Captured Enemy Ammunition

Iraq is littered with both UXO and cached ammunition—referred to as CEA. Within the 4th Infantry Division area, Task Force Able was charged with securing and destroying large caches of CEA. Some of it was located in fixed sites, but much of it had to be located and destroyed in place. The more of this unsecured ammunition that was destroyed, the less that would be available for the enemy to use against the coalition (notably as the basis for IEDs and explosives). In all, the task force destroyed several hundred tons of CEA and cleared thousands of square miles of terrain. Additionally, it managed several large fixed sites and turned these over to US Army Corps of Engineers contractor teams for long-term destruction.

Civil Infrastructure

Task Force Able brought a wealth of talent to the civil infrastructure effort, a major step in creating a secure and stable Iraq. The task force worked across the division to orchestrate the building and repair of a myriad of water treatment facilities, power plants, civilian bridges, and schools. Working closely with local Iraqis, the task force helped facilitate the creation of local governments in some areas. The bulk of the Iraqi people



Figure 4. Buffalo (left) and Meerkat (right) Mine Detection Systems

with whom the units worked were appreciative, and the soldiers saw very positive behavior in response to their efforts.

An important facet of the Task Force Able civil infrastructure repair was the level of involvement from local Iraqis. The task force sought to instill self-sufficiency by letting Iraqi engineers and local firms take the lead whenever possible. In dealing with a people who were subjected to an oppressive regime for more than 20 years, the task force wanted to emphasize the Iraqis' right and responsibility to take care of their own country. The unit did this by allowing the Iraqis to take control of their own destiny in terms of prioritizing what needed to be done and then by instilling a culture of stewardship in order to care for and maintain what they had.

Observations

Throughout their mission in Iraq, the leaders of Task Force Able worked to identify lessons learned based on their experiences. In no way all inclusive, they represent some take-aways that can be used for preparing soldiers and units for future operations.

Every Soldier Is a Rifleman. The Army Chief of Staff is right on target that every soldier must be a rifleman first. All soldiers are expected and need to have traditional combat skills. They must be experts with weapons. They must know first aid. They must know how to communicate with organic communications systems. The unpredictability of operations dictates that there are no rear troops in Iraq. This has some readiness implications. Every unit needs to bear down and

take a hard look at how and what is being trained. Task Force Able leaders would willingly sacrifice technical engineering expertise for fighting skill. Balance is key, of course, but leaders—particularly RC leaders who have scarce training time—must make some hard decisions on what they train and how they train.

Predeployment training is not normally enough. First, common task training, often given short shrift at the end of a fiscal year, is critical. Second, training must be realistic. Leaders cannot wish themselves into a benign environment. Make training hard and challenging. Third, the Army must institutionally look at the concept of tiered readiness for equipping and preparing our soldiers. All units are likely to engage the enemy, and all have sufficient contact time. Thus, there is a valid argument that all soldiers need a basic level of common combat equipment, independent of their assigned unit.

Every Vehicle Is a Fighting Platform. Whether they ride in a Bradley fighting vehicle, a dump truck, or a bucket loader, soldiers need to do the best they can to prepare their vehicles for combat and develop the tactics, techniques, and procedures (TTP) to make their vehicles effective. The Army is rushing ahead with Kevlar® blankets, force protection kits, and up-armored, high-mobility multipurpose wheeled vehicles (HMMWVs), but units—particularly those operating in thin-skinned vehicles—need to take measures to protect themselves. Such protective measures as sandbags on the floor and prefabricated armor are critical and protect soldiers during engagements.

Every Convoy Is a Combat Operation. Nothing is routine on the noncontiguous battlefields on which our forces operate, and every leader and soldier must treat each convoy and movement as a combat patrol and expect contact with the enemy. All the traditional precombat checks and inspections must be reinforced and become second nature. These include briefings and rehearsals that stress contact with the enemy, evacuation plans for wounded soldiers and damaged vehicles, and the use of indirect fire. Aggressive, offensively minded soldiers are less vulnerable to an enemy that looks for a soft target.

Discipline Is Essential. All units must be disciplined to do what is expected and to fully inculcate the priorities of work: security, maintenance, hygiene, food, and rest. These priorities require constant reinforcement at the lowest level, but disciplined units will absorb them and become more combat effective each day. Senior leadership must ensure that basic standards of discipline are instilled throughout the unit—particularly within the junior leaders who are responsible for enforcing the discipline daily.

Efficient Internal Lines of Communication Are Critical. Units must be able to rapidly transmit information both horizontally and vertically. Dissemination is critical to get the word out on changing enemy TTP and to ensure full situational awareness. This ability to communicate bleeds into two other observations:

- **Exploit Actionable Intelligence.** Intelligence comes from many sources, and units must aggressively move it up and down the chain. Intelligence cannot wait at one level, since much of it—normally human intelligence (HUMINT)—is exceedingly temporal. Every soldier is a HUMINT collector—locals frequently freely provide information to soldiers of all ranks and positions. The information that soldiers gain in their interactions with locals must be quickly reported and disseminated through the appropriate chains.
- **Rapidly Disseminate Lessons Learned/TTP.** As the enemy changes, lessons learned/TTP must be rapidly shared. Units must become practiced in pushing and pulling this form of information. They must do this while continuing their missions and in contact. In-theater training becomes extremely important to ensure the sharing of this new information.

AC/RC Integration Is a Reality. As stated earlier, AC/RC integration works. Our Army is strengthened by our RC units, which have incredible strength. However, all leaders need to be sensitive to the differences in the AC and the RC. Differences such as personnel manning and how family readiness groups are organized must be taken into account. Despite these differences, active AC/RC integration (at least for the engineers) is a success. The daily operations of Task Force Able attested to this observation, as AC and RC units worked side by side with uniformly outstanding results.

Junior Leaders Must Be Empowered. The nature of battle in Iraq is a series of small-unit fights and actions over wide distances. Though 21st century communications can give senior leaders situational awareness, we still need to rely on the local decisions of the junior officers and NCOs on the spot. Senior leaders have a responsibility to resource and provide intent and then give the leaders on the ground the flexibility to work within that intent. This is sometimes hard in training and at combat training centers, but it is essential for success on the battlefield.

Civil-Military Operations Must Be Trained. Civil-military operations are often treated as residual tasks, but within the context of a greater conflict, they need to be on every leader's training card. The "three-block war" includes phases from peacekeeping to combat—sometimes occurring simultaneously only blocks away—and it exists in the current environment.¹ Soldiers need to understand the difference and the subtleties of each. They have to have internal governors and training to recognize the differences and to act accordingly. All soldiers are civil affairs soldiers.

Conclusion

During Operation Iraqi Freedom, the diverse mixture of combat and construction engineers (active duty, National Guard, and Reserve) comprising Task Force Able provided the 4th Infantry Division with versatile and effective echelon-above-brigade engineer support. Along multiple lines of operation, the task force demonstrated the potential capabilities and contributions of a combat engineer group operating as an echelon-above-brigade force. Now back at their home stations, the units of the task force will use their experiences in Iraq as a foundation for demanding, realistic training in preparation for future combat operations. 

Colonel Toomey commands the 555th Engineer Group at Fort Lewis, Washington. He has had numerous command and staff assignments, to include Commander, 14th Engineer Battalion at Fort Lewis. He is a graduate of the United States Military Academy, the British Army Staff College, the Naval War College, and the Massachusetts Institute of Technology.

Endnote

¹Charles C. Krulak, *The Strategic Corporal: Leadership in the Three Block War*, Center for Army Lessons Learned, Fort Leavenworth, Kansas, 1999.



ENGINEER MINE DETECTION DOGS

By Mr. James Pettit and Captain Ronald J. Hughes



There is a significant mine threat in numerous countries that US forces have the potential to be deployed to for operations in support of national strategy. As the current levels of mine contamination are unconfirmed, the threat to the movement of US troops can be significant. Proven safe routes can change overnight, requiring the use of engineer resources to clear and proof these routes and accesses to critical locations. Somalia, Bosnia, Kosovo, and Afghanistan are a few of the high-profile places where the US Army has deployed in high-risk mined areas. This article includes information on how mine detection dogs (MDDs) enhance the US mine clearance capability and why they are a necessary tool for the force.

From ancient beginnings, the training for military working dogs (MWDs) has been continuously refined to produce a highly sophisticated and versatile extension of a soldier's own senses. Even the most complex and sensitive machines are unable to duplicate the operational effectiveness of a properly trained working dog. The US Army first used dogs for mine detection in World War II, when the 228th Engineer Mine Detection Company deployed about 100 dogs in Algeria and Italy. During the Vietnam War, the US Army and the US Marine Corps used dogs for mine detection, tunnel detection, and tracking.

During the 1970s and 1980s, several US Army laboratories conducted technical studies to test dogs' abilities to perform mine detection under

various conditions. A 1977 study by Nolan and Gravite (Mine Detecting Canines) concluded that mine/booby trap detecting canines represent highly adaptable, sensitive, and specific detection systems. The report also conceded that MDDs are reasonably durable and readily reproducible. In 2002, the US Army contracted for MDDs to work in Afghanistan, where the



Training an MDD on a short leash

dogs cleared areas, proofed the work by mine clearing armor-protected (MCAP) D7 bulldozers, and cleared mined soil berms created by MCAP D7 clearance operations. In 2003, the Army began to establish its own MDD detachment within the Engineer Regiment.

Why use dogs for mine detection? MDDs provide a fast and efficient detection capability that can save lives. They can reduce the risk involved with mine clearance during combat or peacekeeping operations. They have excellent mobility and utility over ground that is not accessible to vehicles and other mechanical clearance/detection equipment. MDDs provide a detection capability without touching the device itself, and MDDs will not initiate magnetically influenced fuzes.

MDDs must not be seen as a fail-safe panacea. However, it is accepted that they have a high detection rate and that they offer rapid mine/explosive vapor detection. Additionally, MDDs provide a faster mine detection capability than current magnetic-anomaly detection equipment and manual probing techniques. It must be understood that MDDs are merely an additional tool to enhance the productivity of mine clearance operations and to help ensure the safety of the soldiers. MDDs are not a stand-alone system for conducting mine clearance operations.

Specific tasks that MDD teams (each consisting of an MDD and its handler) are capable of performing include assisting units with locating minefields in area surveys and performing field and road surveys and casualty evacuation. MDDs can recognize mines by the distinct odor of the explosives or other components of the explosive devices, including the metal and plastic casings surrounding the explosive. MDDs will sit when they discover a scent that they have been trained to locate. They are operationally suitable when used to supplement other preventive measures that are taken to locate and/or avoid mines, improvised mines/explosive devices, and surprise firing devices. Traditional engineer mine detection tasks benefit from the use of MDDs. They reduce the time spent on a search and will search for mines in open areas, fields, woods, and along embankments. MDDs are also an excellent tool for route-proofing along roads and railways. An MDD team can be used in a minefield extraction role to search a path to a given location, such as a crashed vehicle, or in support of area searches and route proofing.

MDD teams can be employed in different ways. Engineer and explosive ordnance disposal (EOD) assets can be tasked to dispose of unexploded ordnance (UXO) when contamination exists on main supply routes. Using MDDs to determine whether a mine threat exists can significantly reduce the closure time and any delays that may be imposed. Examples are as follows:

- **Vehicle accidents.** When a vehicle has left the roadway during an accident, there is the potential that it has entered a mined area. Current tools are slow and may impose delays in situations involving casualties that require immediate evacuation. MDDs provide a fast detection capability,



Training an MDD on a long leash with a surface-laid mine

allowing any mines between a known clear area and the vehicle/casualty to be marked and avoided.

- **Route proofing.** Current procedures use mechanical means, such as rollers and detectors, for route proofing. MDDs provide a significantly faster detection capability, allowing routes to be proofed more quickly and efficiently and to a greater degree of accuracy.
- **Building and roadblock clearance.** MDDs can reduce the time required for formal proofing and clearance when it is necessary to obtain access to buildings or get through roadblocks that were created by the piling of rubble that may be mined.
- **Area identification.** Area identification, as a mission, is singled out for assured mobility. MDDs lend speed to identifying areas with and without mines and allow a commander flexibility in mobility.
- **Quality assurance/proofing.** Quality assurance/proofing is a role for MDDs that will most likely be done out of enemy contact and in a relatively secure environment.

In all of these circumstances, the detection/proofing capability is conducted using MDDs in a low-risk environment. Because MDD assets are limited in the Army, they should be protected from direct/indirect fire. Where casualties result from vehicle accidents or mine strikes, MDD operations can be conducted under fire or during a high threat in order to aid the quick removal of casualties.



An MDD isolating an odor pattern

To obtain the maximum value from the services of trained MDD teams, it is essential to have a sound understanding of their capabilities, limitations, and conditions for employment. MDDs must be considered as additional, specialized detection tools and should only be used after a careful analysis of the situation, the climatic conditions, and the terrain.

MDD detection and warning capabilities stem from the combination of their training and superior scenting abilities. MDDs realize their fullest potential when conditions permit them to use their superior olfactory senses.

The actual continuous working time and the number of tasks that MDDs can perform will depend on the ability and character of the individual dogs. MDDs work on a short leash or a long leash under the direct control of the handler. MDDs will search for and indicate to their handlers the presence of all mines on which they have been trained. MDDs are mobile and easily transported, are capable of working in a variety of conditions and terrain, and increase the speed and efficiency of the task.

Commanders are encouraged to request MDD teams before entering areas where the probability of encountering minefields or booby traps is high. Once MDD teams are assigned to support a mission and the handlers are briefed, commanders should obtain the handlers' recommendations for the most effective employment of the MDD teams and best working positions and route selections, consistent with the factors that influence the dogs' detection capabilities. Commanders are cautioned that MDD support is used to search for casualty-producing devices and is not a substitute for unit security and safety planning. Commanders must ensure that unit personnel are careful to observe all cautions issued by the handlers.

Commanders should integrate MDD teams fully into the mission and include them in preparatory inspections and rehearsals. This will help to ensure that the handlers understand the breadth and scope of the mission. Commanders must designate security elements, if required, to overwatch MDD teams as they perform their mission.

MDDs are normally attached on a mission basis. Before assignment to any operation, the dog handler leader (a specified handler who is in charge of multiple MDD teams) is carefully briefed on the planned mission as far in advance as possible. This allows time for—

- The dog handler leader to select teams that have worked with the supported unit before and/or those teams that will be most effective for the particular mission.
- The handlers to prepare themselves and their dogs.
- The dogs to become familiar with the scents of the individual unit members.
- The unit members to familiarize themselves with the MDD team method of operation.
- The tactical unit to understand the MDD teams' capabilities and limitations, the temperament of the dogs, and any items of special interest.

Once an MDD team deploys to a theater, the MDD must be given time to acclimatize. The period of time required will largely depend on the degree of climatic change. MDDs should not be used on a live operation until 4 weeks after arrival in theater. Additionally, transferring a dog suddenly from one climate to another, such as from an air-conditioned room or vehicle to a hot environment, is detrimental to its capability. The MDD handler has the definitive say on whether his MDD is capable of working in particular climatic conditions.

It takes 6 months to train an MDD before deployment. At the end of the training period, the handler is fully acquainted with the dog's aptitudes, moods, and behaviors under different conditions. However, in order to maintain a high level of proficiency, MDD teams should undergo regular refresher training while in theater. MDDs will maintain their value as detecting tools only if they receive constant proficiency training.

Mr. Pettit is the program manager for engineer mine detection dogs at the United States Army Engineer School at Fort Leonard Wood, Missouri. He developed the initial concept and supervised the development and implementation of the 67th Engineer Detachment (MDD).

Captain Hughes is the first commander of the 67th Engineer Detachment and was instrumental in proving the concept of soldier-handled MDDs in Afghanistan. He was the primary author of Special Text (ST) 20-23-8, Use of Demining Dogs in Military Operations, and was responsible for training area development and training planning at Fort Leonard Wood for the dog detachment. Captain Hughes is a graduate of the United States Military Academy.

OPERATION TUNNEL: CONFINED-SPACE OPERATIONS WITHIN THE TUNNELS OF CHICAGO

By Captain David Noble and Captain James Allen

In the spring of 2003, the 863d Engineer Battalion (Combat) (Heavy) commander decided to start analyzing hot-topic current events surrounding global military operations, focusing on urban environments. Taking into account the actions in Baghdad, urban terrorist actions, and the potential for future city-oriented engagements, he realized that construction engineers might be called on to conduct specific underground missions within the tunnels of major cities, which is reminiscent of the tunnel rats of the 1960s in Vietnam. However, there was no established military training on how to conduct effective underground operations. Being a United States Army Reserve (USAR) officer in a USAR battalion, he not only had civilian experience but also was supported by a battalion staff filled with civil engineers that were required by

civilian and state industry to be trained on confined-space operations. With this knowledge and the drive to cover all the possible scenarios that a construction engineer might face, the commander gave the order for the battalion to initiate a mission training plan to create a platoon of engineers capable of conducting effective underground operations (with all the safety and combat considerations involved).

Operational Concept

Operation Tunnel, as it was titled early in the military decision-making process, was a unique planning experience, since there was no established military guidance for such a mission. It was the same as creating military



While underground, soldiers conducted radio operations and tested night vision goggles.



Soldiers and members of the Office of Emergency Management conduct a joint tunnel inspection.

operations on urbanized terrain training for the first time; a team would have to analyze enemy tactics, after-action reviews, and planning considerations in a post-Cold War scenario. The planning and execution focused on four major areas:

- Confined-space training and duties/responsibilities
- Combat considerations in an underground environment
- Equipment and operations
- A tunnel exercise within the Chicago tunnel system (Operation Tunnel)

The original plan allowed for 6 months from start to finish. With the initiative of the battalion staff and the determination of the command and battalion Operations and Training Officer (S3), the mission was ultimately executed within 5 months. However, the road to success was paved with many obstacles. This was expected, since it was the first time for not only the battalion but also for the support agencies to perform this type of mission.

Confined-Space Training

Using an established format from the civilian sector, which had been proven by state and local agencies, the battalion had the basis for a training plan. The training concept took into consideration many factors that civilian engineers had faced and proved to work. The overall objective was

to provide familiarization to soldiers in case an operation of this type might be required. Associated hazards with confined-space operations, entry-and-rescue procedures, and personal protective equipment were only some of the objectives identified. The battalion commander identified confined space as an area that is large enough or so configured that a soldier can enter and perform work with limited or restricted means of entry or exit and is not designed for continuous military occupancy.

A basic four-soldier team was developed to identify key areas of emphasis for underground operations. This team included the following:

Entry Supervisor. The entry supervisor was the overall officer in charge of the operation and provided command and control for

the team. He recognized the effects of exposure to hazards that were reasonably expected to be present and performed the duties and responsibilities identified in Air Force Occupational Safety and Health (AFOSH) Standard 91-25.¹

Entrant. An entrant was anyone who entered the area of operation (actually went into the tunnel). There could be multiple entrants during a mission. Each was briefed on his specific function, focus, and area of responsibility and the



Remnants of old warning signs and hauling equipment still remain in the Chicago underground system.

toxic effects and symptoms of exposure. He was trained to detect atmospheric conditions and report physical and atmospheric hazards to the attendant.

Attendant. The attendant maintained an accurate account of all personnel who entered the underground area. Functioning primarily as the entrance guard and staying outside the tunnel or confined space, he also communicated with anyone in the underground area where the operation was conducted. He had the authority to order all entrants out of the area and to keep unauthorized personnel out of the work area.

Rescue Operator. The rescue operator provided medical and rescue support in case of an accident or injury. He maintained retrieval and rescue equipment, was trained in combat lifesaver skills, and typically waited with the attendant outside of the tunnel in case of an emergency.

Certain criteria had to be met before entering the area of operation, in this case a tunnel. The entry supervisor conducted a preentry briefing with all entrants. Precombat checks and inspections were conducted on all mission-specific and personal protective equipment. The attendant and the first entrant had to establish acceptable entry conditions. The entrant conducted initial air sampling as he entered the tunnel. The attendant was in position from start to finish. Communication was established between the entry supervisor, the attendant, and the entrant, with strict orders that if communication was broken, the entrant would return to the attendant. Once these criteria were met, the entry supervisor reported all actions to the higher headquarters.

Combat Considerations

Confined-space operations have multiple hazards that must be considered, some visible (physical) and some nonvisible (atmospheric). Physical hazards include the following:

- Unguarded machine parts
- Heat
- Exposed electrical circuits
- Slipping and falling
- Engulfments
- Entrapments



Soldiers use an air monitor to test the atmospheric conditions at the entrance of the tunnel system.

- Noise
- Vibration
- Poor lighting
- Wildlife

Atmospheric hazards include the following:

- Oxygen richness/deficiency
- Combustibility
- Flammability
- Explosibility
- Toxic gases
- Dust, vapors, and mist

During planning, all these hazards were briefed in the same manner as any other risk management procedure. These potential risks were part of the mission, and risk assessments were created to capture them with ways identified to counter and continue the mission should any of them occur.

Equipment and Operations

The entire concept for this operation ultimately involved specific equipment that would be required to detect potential environmental hazards and to protect the soldiers during execution. The following equipment was required to enter the tunnel:

Air Monitor. The US Army has no identified air detection equipment as part of the modified table of organization and equipment within a combat heavy engineer battalion. However, since construction operations and foundation work play a heavy part in urban repair, such equipment would prove necessary for mission completion. For Operation Tunnel, one of the several agreements between the USAR and the city of Chicago involved the Chicago Office of Research and Development allowing the battalion to have access to an air monitor. During execution, the soldiers trained with a GasTech® GT-402 air monitor. The table below shows the four major atmospheric conditions that the GasTech GT-402 detects.

GasTech GT-402 Monitoring Capability

Element	Warning	Alarm
LEL/ppm	10%	50%
Oxygen	23.50%	19.50%
Hydrogen sulfide	10 ppm	15 ppm
Carbon monoxide	25 ppm	200 ppm
Legend: LEL = lower explosive level ppm = parts per million		

Fall Arrest System. This system would be required for a vertical entry, which was covered during briefings. However, a horizontal entry was used for this operation, thus eliminating the need for this equipment.

Ventilation Equipment. Due to the unknown amount of breathable air, ventilation equipment is recommended for prolonged periods in confined spaces. There are methods to circulate breathable air, while at the same time diluting or flushing out atmospheric hazards.

Lighting System. Special lighting was required because of the dust particles underground. Normal flashlights are not recommended due to their unstable reaction when turned on. An easy alternative is a chem-light. There are also special flashlights available in the civilian market, which are used by virtually every gas and sewage facility in the country.

Communications Equipment. During our mission, we used Single-Channel Ground-to-Air Radio Systems (SINCGARS) to maintain constant contact. Cell phones and other alternative means of communication are dangerous, because they can create an electrical spark that could ignite combustibles or flammables, causing an explosion.

Body Harness and Lifelines. Based on the severity of the area of operation, lifelines connected to the entrants could be used to maintain physical contact. An easy alternative would be to use 550 parachute cord.

Working Winch. Mainly used by the rescue operator, this device would connect to the lifeline and extract entrants mechanically during a vertical extraction.

Operation Tunnel

On 13 September 2003, at the battalion headquarters in a Chicago suburb, soldiers from all four companies and a complement of the battalion staff gathered for the tunnel exercise. The instruction focused on confined-space operations, the battalion confined-space standard operating procedure, operation of the air monitor, and a safety brief. Those trained included two civilian representatives from the 88th Regional Readiness Command Safety Office, who had been part of the planning process since Day One. Recognizing this as a new type of training with no established policies or procedures, the safety personnel monitored our training and execution and provided insight when applicable. They recognized the need for the air monitor, special lighting equipment, and rescue personnel. After accepting our risk assessment and level of detail in the training modules, they gave the final approval for execution.

Safety was not the only consideration during the planning process for this mission: legal considerations nearly cancelled the entire operation. Representatives from the city of Chicago, the USAR Center Legal Assistance, and the 88th Legal Assistance Office meticulously identified all the legal implications if an accident were to occur. A military operation within city limits, focusing on training that was "opportunity training" at best, posed a high risk for all involved. Ultimately, it was recognized at the eleventh hour (with the 88th Safety Office, a guide from the city of Chicago, and a thorough training plan) that this mission would be a success.



Soldiers travel through part of the tunnel, prepared to conduct Operation Tunnel.

Twenty-four soldiers (five soldiers from four companies and four from the battalion) convoyed to Chicago City Hall, where they established the entry supervisor, the entrants, the attendant, and the rescue operator. At that same time, the Chicago Office for Emergency Management was conducting similar training and reviewing underground schematics, which is a periodic requirement for that organization. So the two groups, ranging upwards of 50 people, proceeded together to tour the tunnels.

Before entering the tunnel, certain entry procedures had to be met. First, the entrant with the air monitor had to test air concentrations outside the entrance. In this case, the entrance involved a secured door, much like a submarine hatch. Once opened, the entrant had to test the air at the opening and then on the other side. Fortunately, the GasTech GT-402 is capable of continuous operations and beeps when toxic levels are high. For vertical entry, the entrant with the air monitor must test atmospheric conditions in 3-foot increments. The air monitor used for Operation Tunnel came with a 30-foot extension hose. As the hose was lowered, the fact that the hose (no matter what the altitude) was still 30 feet long had to be considered, so the same planning factors (based on 10 seconds per foot for air to travel through the hose) had to be considered. Whether a hose is 6 or 16 feet underground, 5 minutes must be allowed per test (10 seconds x 30 feet = 300 seconds or 5 minutes).

Conclusion

The soldiers from the 863d Engineer Battalion traveled 5 miles through the tunnels, which covered only 2 percent of the overall tunnel system, then exited and completed their mission. Although this was valuable training, it was only familiarization training. No one was validated or certified to conduct confined-space operations. However, the soldiers can now appreciate the inner workings of such a mission and will be better prepared if they are called on to conduct this type of operation in the rebuilding of other nations.



Captain Noble is the Active Army/Reserve Component S3 plans officer for the 863d Engineer Battalion. He was a platoon leader in the 2d Engineer Battalion, 2d Infantry Division, and a company commander in the 1st Engineer Battalion with the 1st Infantry Division. Captain Noble holds a bachelor's in communications.

Captain Allen was the civil engineer for the 863d Engineer Battalion. He is currently deployed overseas in support of Operation Iraqi Freedom with the 980th Engineer Battalion.

Endnote

¹AFOSH Standard 91-25. *Confined Spaces*. 1 February 1998, Paragraph 2-13.

(“Engineer Battalion Headquarters,” continued from page 12)

Humanitarian Projects. The 203d also played a role in humanitarian efforts to rebuild the country. The battalion directed Task Force Wisdom, a project to rebuild schools in Baghdad that included both US engineers and Iraqi contractors. They renovated 16 Iraqi schools and assessed 12 more. The project also established a standard operating procedure for similar projects across Iraq. HSC soldiers conducted clean-up efforts at a refugee camp. They also provided medical aid, supplies, food, and shoes to needy Iraqis around the city. These items were donated by family members of the 203d and the Neosho, Missouri, Junior High School.

Deployment Extension Missions

The most emotionally difficult mission the 203d soldiers faced was the extension past their 1-year anniversary. They had already packed and shipped home much of their equipment and personal items when they received word that they would remain in theater. Moving out of the base camp in Baghdad, HSC headed into the desert outside of An Najaf. HSC and Alpha Company established Camp Duke to support 2d Armored Cavalry Regiment (Light) operations against al Sadr's forces. HSC took the lead on the base camp force protection measures, constructing protective berms and ditches around the camp. In addition to construction work, the company manned the entry control point, provided a quick-reaction force, and conducted the reconnaissance and surveillance patrols that kept potential enemy forces away from the camp and the adjacent ammunition supply point. These missions required close coordination with civilian contract security personnel and Iraqi police, who shared responsibility for the site. Over a 2-month period, the battalion built or expanded camps in An Najaf, Diwaniyah, and Al Kut.

While at Camp Duke, HSC also took responsibility for the regiment's detainee facility. A platoon of combat engineers from the Minnesota Army National Guard was attached to the company to conduct the mission. The facility received high marks from inspectors for its security, the care provided to the detainees, and the professionalism of the soldiers who operated it.

Conclusion

As the high pace of operations continues across the globe, more units will be performing missions and operating in ways that they had not expected. Soldiers and commanders will need to anticipate requirements and concentrate on basic warfighting skills, never assuming that a mission is outside their lane. In operations across Iraq, HSC soldiers from the 203d Engineer Battalion performed with agility and flexibility. They never hesitated to take on new missions outside of established doctrine and built a solid record of performance and accomplishment.



Captain McDaniel commands Headquarters and Support Company, 203d Engineer Battalion (Missouri Army National Guard). Previous assignments include engineer platoon leader, battalion S1, engineer equipment officer, engineer brigade staff officer, and the Joint Task Force Alaskan Road staff.

SECURITY OPERATIONS IN SUPPORT OF THE DIVISIONAL REAR AREA



*By Captain Bryan K. Sizemore
and Master Sergeant James Duncan*



Headquarters and Headquarters Company (HHC), 54th Engineer Battalion (Corps)(Mechanized), based in Bamberg, Germany, is assigned to the 130th Engineer Brigade, V Corp's organic separate engineer brigade. The company received deployment orders as part of the ongoing Global War on Terrorism and Operation Enduring Freedom on 31 December 2002. After arriving at Camp Virginia, Kuwait, on 13 February 2003, the company began reception, staging, onward movement, and integration (RSOI) tasks in preparation for wartime operations with the 3d Infantry Division (3ID) (Mechanized). HHC crossed the line of departure with the 3ID on 19 March 2003 as part of Operation Iraqi Freedom and quickly became a valuable member of the division team.

Examined in this article are the nonstandard missions completed by an engineer HHC supporting security and force protection efforts throughout the rear area of operations for the 1st Brigade Combat Team (1BCT), 3ID. Also discussed are the planning considerations that must be taken into account during security support operations and how versatile, agile,

and dedicated soldiers from multiple military occupational specialties (MOSs) create a combat multiplier on a complex battlefield.

Operational Orders

Before crossing the line of departure, HHC received operational orders placing it in direct support of the 1BCT, 3d Forward Support Battalion (3FSB). The company quickly established liaison with key leaders and members of the 3FSB tactical operations center (TOC) and began attending their battle update briefs and commander updates. While members of the company continued to complete RSOI tasks at Camp Virginia, the HHC commander and first sergeant began daily convoy operations to Camp New York to meet with the leadership of 3FSB and establish a set of tasks that would ensure HHC full integration with 3FSB and its scheme of support. The company leadership made the decision early to offer assistance anywhere soldiers could be of use. Of vital interest to 3FSB was the issue of force protection

throughout the phases of the war. The ability of soft targets (such as fuelers, logistical trucks, and soft-skin high-mobility, multipurpose wheeled vehicles [HMMWVs]) to protect themselves during the 450-kilometer road march across the Iraqi desert was a concern. The plan also called for scheduled halts and Class III retail and bulk refueling point operations that are extremely vulnerable to enemy direct and indirect fires. Additionally, a major concern was the issue of force protection with respect to field hygiene. Commanders at all levels recognized that the effects of poor hygiene could cripple units.

The 54th Engineer Battalion commander decided to task-organize the battalion engineer assets wherever they would make the most impact on the success of the overall mission. Specifically, he provided HHC with engineer support equipment to meet the needs of 3FSB throughout the phases of the battle. HHC would have access to equipment and missions that traditionally would have been given to other engineer units. Two of the four line companies organic to the battalion were in direct support roles with adjacent brigade combat teams of the 3ID and were unavailable to provide support to HHC missions. Bravo Company, 54th Engineer Battalion remained organic to the battalion and, based on the 3ID scheme of maneuver, would remain within range and traveling distance of HHC during the battle. Bravo Company would have the ability to provide support with the M9 armored combat earthmover (ACE) and FLU-419 small-equipment excavator (SEE), as necessary. The battalion also had direct control of the assets from the 299th Multirole Bridge Company, whose hydraulic excavator (HYEX) and D7 dozer were vital to the mission.

Security Operations

Before deployment, HHC conducted an intensive weapons training program focused on making each soldier a "small arms master gunner." Each soldier completed Army standard zero and qualification with his assigned weapon at the local ranges located outside Warner Barracks in Bamberg. HHC initiated and completed weapons cross-training of various combat systems, to include an M249 squad automatic weapon, an M9 9-millimeter pistol, an M2 .50-caliber machine gun, and an MK19 40-millimeter grenade machine gun. HHC continued to reinforce this training upon arriving in Kuwait. The company drilled this concept until each soldier could operate and maintain each of the weapon systems available to them. This gave the command confidence that soldiers of every MOS understood and knew how to employ each of the various weapons systems, which influenced the structure of the 3FSB convoy during ground movement.

Twenty-one Bravo Company engineers from the support platoon also provided the 3FSB commander with a more highly trained combat force that was accustomed to dismounted operations. During traffic bottlenecks along main supply routes and during temporary halts, support platoon engineers would dismount from their vehicles and provide an excellent security perimeter not only for HHC vehicles but also for the entire

3FSB convoy. When stopping during the march, the engineers' knowledge of dismounted operations, their confidence in the marksmanship of their soldiers, and their discipline created a safe and stable environment.

Force Protection

At certain points during the battle, 3FSB conducted "tactical pauses" so the forward elements of the division could shape the battlefield and provide security for follow-on forces moving toward Baghdad. During these tactical pauses, engineer assets were employed for a variety of purposes that increased the overall force protection and security of 3FSB.

During coordination efforts with the 3FSB commander and staff, HHC developed a prioritization of engineer tasks to be completed in support of the battalion. Because of repeated threats of mortar and artillery fires, completing force protection berms around the 3FSB TOC and around the northern perimeter of the tactical assembly area (TAA) center became mission-essential tasks. Creating crew-served weapon fighting positions throughout the 3FSB perimeter and field sanitation trenches became an additional mission-essential task based on the mission, enemy, terrain, troops, time available, and civilian considerations (METT-TC).

Nonstandard HHC Missions

The HHC executive officer was given the responsibility for command and control of force protection efforts in support of the 3FSB TOC. The assets available were an M9 ACE team, a SEE from Bravo Company, a D7 dozer, and a HYEX from the 299th Multirole Bridge Company. The executive officer coordinated with each unit after receiving the verbal tasking authorization from the battalion staff. They developed a linkup location, and the HHC first sergeant escorted each piece of equipment and the prime mover from their TAA south of the location to 3FSB.

From earlier experiences during the war, moving the D7 dozer and the HYEX on flatbed M916 trailers was a delicate operation. The desert terrain made movement difficult and march rates slow, and there was a high probability of the trailers becoming stuck in the sand. This risk was mitigated by using the organic heavy expanded-mobility tactical truck (HEMTT) wreckers as part of the linkup operation, ensuring the capability to recover assets. HHC created a security escort convoy to safely move personnel and equipment from one TAA to another.

At the 3FSB headquarters, the first sergeant released control of the M9 ACE team to the company executive officer. Earthmoving operations were based on the previous coordination conducted between the company and the 3FSB staff. The team created berms around the entire 3FSB TOC during three separate tactical pauses. The blade work was at a standoff distance from the TOC. This allowed for continual operations and improvements to the TOC, as required. They also ensured that the berms did not interfere with vehicle traffic and the movement of the 3FSB.

Using Experience

The first sergeant controlled operations of the D7 dozer and the HYEX. As a former assault and obstacle platoon sergeant and an observer-controller at the National Training Center, his experience became invaluable in directing engineer efforts on the ground. The D7 dozer team began creating force protection berms at the most northern point of the TAA. This involved operating forward of the 3FSB perimeter during limited visibility and with little or no rest. The first sergeant of the company operations section and the 3FSB TOC established procedures to mitigate the risk of soldiers operating forward of the TAA. They established regular reporting criteria with the battalion and emplaced chemical lights that could be seen by the nearest fighting and guard position. The dozers constructed force protection berms along two of the three sides of the battalion's northern perimeter. After completing the mission, they moved to the center sector of the TAA to create blast protection walls around the 5,000-gallon fuel tankers. Direct coordination with the commander of the Class III distribution company was essential to ensure that blast protection walls were placed properly. This allowed the tankers to quickly move from their positions if the TAA became compromised by enemy threat. The dozers created earthen walls on two sides for nearly fifty fuel tankers and additional berms to better protect the HEMTT fuelers belonging to the 3FSB team.

The support platoon leader directed the efforts of the SEE. The 3FSB wanted crew-served weapon positions dug around their perimeter. The HHC commander made recommendations on the location of the fighting positions to the 3FSB commander, based on a terrain walk of the entire perimeter. HHC convinced the 3FSB staff to establish the fighting positions based on a terrain analysis at regular intervals along the perimeter to maximize the effectiveness of the SEE. Standard .50-caliber machine gun crew-served fighting positions were created to enhance force protection and security of the battalion. The SEE and its operator were outstanding in making this happen. When possible, the SEE operator created individual fighting positions along the perimeter to protect soldiers from mortar and artillery threats. At the same time, across the entire perimeter of the TAA, soldiers were also constructing individual fighting positions.

Once the SEE operator constructed the fighting positions forward of the perimeter, it moved inside the perimeter to create trench latrines and trash burning pits. This is a critical task and is very important to every soldier and commander. Failure to consider this can have a devastating impact on a unit. The spoil created from the digging could be thrown over the latrines and pits once the company moved or used to mitigate the smell of the latrines and the threat of disease. Based on the total size of the 3FSB perimeter and the number of personnel, one trench latrine and garbage pit was constructed for every three companies. One company was given the responsibility for marking and maintaining the holes to ensure soldier safety.

These temporary latrines and garbage pits greatly mitigated the risk of disease spreading throughout the TAA.

Guarding the Perimeter

The company focus on making every soldier a small arms master gunner paid off in the desert of Iraq. The leadership realized that during battle the company would not have the luxury of placing an engineer behind the butterfly of each .50-caliber machine gun because of the need to man the weapon system 24 hours a day. During each halt, the company began preparing tripod-mounted M2 .50-caliber machine gun fighting positions. Mechanics, fuelers, administrative specialists, cooks, engineers, medics, chemical officers, and supply clerks took turns operating and maintaining the machine gun. Dismounting from the vehicle and emplacing and operating the .50-caliber machine gun became a battle drill. Soldiers quickly learned that once the first shot was fired, this system could save lives. The company leadership also stressed the importance of the AN/TVS-night vision sight 5 for the weapon. This device was crucial in detecting enemy presence forward of the position at the TAA, tracking the status of engineer efforts forward of the fighting positions, and identifying friendly forces adjacent to the TAA.

Summary

An engineer HHC in support of a divisional brigade combat team can greatly enhance the readiness and warfighting capability of an organization. Mission-essential tasks, such as commanding and controlling engineer operations with the battalion staff and sustaining the force with the support platoon, will continue to constitute the bread-and-butter tasks for the unit. However, they are combat multipliers on other levels. The experiences of the leadership—from the commander and first sergeant, to the company executive officer, support platoon leader, and platoon sergeant—provide the necessary ingredients to complete multiple tasks with limited assets. Using the concept of every soldier being a rifleman first, and the willingness to adapt to a changing and complex battlefield, are essential in providing first-class support to FSB units during war. Given the proper tools, an engineer HHC can greatly influence and shape the battlefield and play a critical role in the success of divisional rear-area operations.



Captain Sizemore is the Recorder, Secretariat for Department of the Army Selection Boards, Human Resources Command, Alexandria, Virginia. He previously commanded the HHC, 54th Engineer Battalion. Captain Sizemore is a graduate of the United States Military Academy and holds a bachelor's in environmental engineering and a master's in engineering management.

Master Sergeant Duncan is attending the Sergeants Major Academy in El Paso, Texas. He previously served as the first sergeant for HHC, 54th Engineer Battalion. Master Sergeant Duncan initially entered the Army as a 12F combat engineer vehicle operator.

The Engineer Command and Staff Course: A New Era of Leader Development

By Major Craig Jolly

The first day of the Engineer Captain's Career Course (ECCC) Class 3-04 marked a transition to a new era of leader development for the US Army Engineer School. This class was the pilot program for the Engineer Command and Staff Course (ECSC), a revised captains' education program that replaces the ECCC. The course redesign incorporates instruction on digital systems and tasks taught in the former Combined Arms and Service Staff School (CAS3). The ECSC is designed to develop adaptive commanders and staff officers for the force who can react to a multitude of situations, based on critical thinking skills and exposure to a range of planning contingencies.

In 2003, the ECCC staff of instructors and training developers conducted an analysis, using the military decision-making process (MDMP), to determine if the sequencing and instruction of the ECCC met the needs of the force. This work group developed two proposed course redesigns: a life cycle model based on the life cycle of taking command, preparing the company and deploying on operations; and a modular design based on end state competencies and critical tasks. When compared to the existing ECCC, both designs validated that the tactical and technical content of the existing course was sound and logical; therefore, improvements in the new design would focus on the delivery of the instruction.

The work group adopted the modular, competency-based design and focused on incorporating critical thinking skills and how to embed these skills into the design. The work group's research also looked into what adaptive leaders require to operate effectively in the

contemporary operating environment. It was determined that the future course should produce graduates who have the ability to act in an uncertain environment and make quick, logical decisions based on the information available. This concept was seen as the basis of maneuver warfare that is underpinned by a critical thinking capability.

The ECSC design is based very closely on the old ECCC. The CAS3 staff requirements have been met by using the current instruction in either student-led discussions and presentations or different instructional methods. The major change seen in the ECSC is in the competencies associated with maneuver warfare (the basis of how to think tactically) and critical thinking (how to think logically, using mind mapping, battle analysis, and the MDMP). The ECSC combines these competencies with a range of repetitive tactical exercises in differing environments to enforce adaptability. Essentially, this entails operating in an uncertain and changing environment as the norm.

The ECSC staff has taken the tactical and technical aspects of ECCC and married them with the critical thinking and maneuver warfare concepts of the contemporary operational environment to produce an intense and challenging course. The ability of the students to adapt to unfamiliar situations by thinking through tactical and technical problems is far above the capabilities that were tested and observed previously. The early assessment is that the graduates of the course will be able to adapt more quickly to the environment they find themselves in and will provide the skill set that Engineer Regiment commanders require on today's battlefields.

While ECSC 3-04 has only just completed the tactics portion of the course, the indications are that the changes made from ECCC are on the mark. The spiral development of this program continues from August to December 2004 and will continue to be tested in Classes 4-04 and 1-05. It is clear from the perspective of the ECSC staff that while the underlying tactical tools remain the same, the development of commanders and staff that are capable of—and comfortable with—conducting critical thinking in unfamiliar and time-constrained environments is a tremendous step forward in engineer leader development. ECSC will not be fully validated until these newly trained leaders deploy on operations in the near future. The ECSC is much more than the ECCC plus. It clearly marks a new era in the way we teach our captains to think, plan, and execute assured mobility tasks in support of the force.



Major Jolly is the chief of the Engineer Command and Staff Course Division at the US Army Engineer School. He has served in a wide variety of engineer command and training assignments within the Australian Army. Command appointments include both the 35th Field Squadron and 23d Support Squadron, and his instructional appointments include a posting to the School of Military Engineering, where he served as the course manager for both the Regimental Officer Basic and Advanced Courses. He is a graduate of the Royal Military College-Duntroon and the Australian Command and Staff College. He holds a master's in management and defence studies from the University of Canberra.

Army's Top Deployers Receive Excellence Awards



By Mr. Henry H. Johnson

"Today's enemy lives on battlefields in the darkest corners of our world, and that requires an ability to rapidly deploy to remote underdeveloped and harsh locations with very little notice. ... Over the past two years, nine out of ten of our active divisions have rotated to Iraq or to Afghanistan, and over 50 percent of our Reserve Component soldiers have been activated in support of current operations. ...Deployment excellence is measured in a variety of ways, including accurate deployment data and training, equipment preparation, organization, and innovation and excellence in support to deploying units. A unit's ability to deploy is a critical measure of readiness and is central to the ability of our Army to accomplish its mission."

These words were spoken by Lieutenant General Claude V. Christianson, Deputy Chief of Staff for Logistics, G4, keynote speaker at the Army's 2004 Deployment Excellence Award (DEA) ceremony on 22 June 2004 in Washington, D.C.

The Army Chief of Staff established the Deployment Excellence Award program in 2000 to recognize active, Reserve, and National Guard units and installations for outstanding deployment accomplishments. The program is open to any unit or installation that has deployed or supported a training or contingency deployment during the competition year (1 December – 30 November). Units and installations can participate in the following categories:

- Large unit (battalion and above)
- Small unit (company and below)
- Supporting unit
- Installation
- Operational deployment

Eligible units and installations participating in one of the first four categories submit self-nomination packets to their major command (MACOM). The MACOM then forwards its top unit packet selections to an Army-level evaluation board, which determines semifinalists within each category. A team of deployment specialists then visits those selected units and/or installations, validates their deployment practices, and determines the best in each category. Each unit's scores (from the board and site validation visit) are then combined and sent to the Department of the Army (DA) G4 for approval and announcement of the winners.

The operational deployment category (introduced in 2003) involves units (active, Reserve, and National Guard) that have to deploy in support of operational missions like the Global War on Terrorism, peacekeeping rotations, and humanitarian relief. Requirements are as follows:

- MACOMs nominate specific deploying units based on their history of deployment excellence, and a team from the Deployment Process Modernization Office observes and scores the deployment preparation and submission of deployment data included.
- Units can contend for either the large-unit or small-unit award.
- Submission of nomination packets is not required, and the unit is not required to do anything other than deploy.

Key dates for the 2005 DEA competition are as follows:

- Competition period: 1 December 2003 – 30 November 2004
- DEA operational on-site visits: 1 March 2004–9 February 2005
- MACOM nominations to DEA board: 31 January 2005
- DEA board convenes: 14–25 February 2005
- Semifinalist list forwarded to DA: 8 March 2005
- DA releases message announcing semifinalists: 11 March 2005
- DEA validation teams visit: 15 March – 15 April 2005
- Winners list forwarded to DA: 19 April 2005
- DA releases message announcing winners: 22 April 2005
- Awards presentation ceremony: 1 June 2005

For additional information, visit the Deployment Process Modernization Office Web site at <http://www.deploy.eustis.army.mil/DEA/default.htm> to download or to view the awards evaluation criteria, checklists, and sample nomination packets.

Mr. Johnson, a transportation system specialist at the Deployment Process Modernization Office, Fort Eustis, Virginia, is currently serving as the Deployment Excellence Award Program Manager.

2004 Deployment Excellence Award Recipients

Category	Winner	Runner-Up
Active Large Unit	53d Movement Control Battalion (EAC) Fort McPherson, Georgia	11th Signal Brigade Fort Huachuca, Arizona
Active Small Unit	Headquarters and Headquarters Company 7th Transportation Group Fort Eustis, Virginia	469th Transportation Detachment 24th Transportation Battalion Fort Eustis, Virginia
Active Support Unit	842d Transportation Battalion Beaumont, Texas	831st Transportation Battalion Port of Salalah, Oman
National Guard Large Unit	2d Battalion, 116th Infantry Regiment Lynchburg, Virginia	1st Battalion, 162d Infantry Regiment Forest Grove, Oregon
National Guard Small Unit	82d Rear Operations Center Lake Oswego, Oregon	Company B 52d Engineer Battalion Lake Oswego, Oregon
National Guard Support Unit	1067th Transportation Company Phoenixville, Pennsylvania	Florida State Area Command St. Augustine, Florida
Army Reserve Large Unit	1192d Transportation Terminal Brigade New Orleans, Louisiana	1394th Deployment Support Brigade Camp Pendleton, California
Army Reserve Small Unit	Headquarters and Headquarters Company US Army Civil Affairs and Psychological Operations Command Fort Bragg, North Carolina	1190th Deployment Support Team 1190th Deployment Support Brigade Baton Rouge, Louisiana
Army Reserve Support Unit	2125th Garrison Support Unit 82d Airborne Division Fort Bragg, North Carolina	307th Quartermaster Battalion Salt Lake City, Utah
All Army Installation	Fort Stewart, Georgia	Fort Bliss, Texas
Operational Deployment Large Unit	2d Battalion 227th Aviation Regiment 1st Cavalry Division Fort Hood, Texas	NA
Operational Deployment Small Unit	Charlie Company 121st Signal Battalion 1st Infantry Division Kitzingen, Germany	NA
Operational Deployment Small Unit	Bravo Company 65th Engineer Battalion 25th Infantry Division Schofield Barracks, Hawaii	NA

Visual Archive. The History Office at the Engineer School is developing a visual archive. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry Roberts, Historian, US Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, please call Dr. Roberts at (573) 563-6109.



The Engineer Small-Group Leader

By Major Chris A. Parks

I must admit that becoming a small-group leader (SGL) at the US Army Engineer School for the Engineer Captain's Career Course (ECCC) was not my first assignment choice after command.¹ I wanted to serve as a recruiting battalion staff officer in my hometown, but that job was filled. So I accepted the challenge of becoming an SGL. My intent was to make a difference and give something back to our great Army that has done so many good things for me and my family.

The Learning Curve

As I progressed in the officer corps, I was given the impression that becoming an observer-controller at the National Training Center or an SGL at a schoolhouse was a tough and challenging job that would ensure special recognition in the eyes of promotion board members. But during my first few months in the job, I learned that there are many important assignments. However, one thing I can say about the captains who become SGLs is that they are true professionals who want to make a difference in the lives of future company commanders.

An SGL spends the majority of his time teaching and working with students. Approximately 321 instructor contact

hours are spent with the students in each class; this time does not include physical training, mentoring sessions with senior officers, formal events, or study sessions. As an SGL is assimilated into the job, the learning curve is steep. They have to relearn things they've forgotten and/or master the numerous changes to their craft.

Mentoring

After leaving command, I was still on fire to help mold and mentor soldiers, and becoming an SGL satisfied that thirst. Even though students are the same grade, they are not considered peers due to differences in their military experience and knowledge level. Mentoring is a mutual agreement between two parties. The students who want to be successful in command listen and pay attention to their SGLs.

Program of Instruction

The program of instruction for the students has been a challenge for every SGL. Because of the command push to get soldiers to divisional units, the US Army Training and Doctrine Command units have fewer personnel available to write and update instructional materials. The SGL

must write the instructional material for the changes in doctrinal principles, sometimes in the midst of a class or during the limited time between classes. The time between teaching students is normally spent taking leave or improving course materials.

Reserve Component

Reserve Component students spend an action-packed two weeks at the schoolhouse. Knowledge flows full throttle during their stay, and I found that their course was a refreshing change. The Reserve Component students came to the schoolhouse as sponges ready to listen and learn, absorbing blocks of instruction and tactics, techniques, and procedures with the intent to return and edify their home units. I know that I could not do what they do—serve two masters. They are professionals within their communities and warfighters for this great nation. I admire them. Their training requires working for two weeks straight, including weekends, and 15-hour days. But it's all worth it when they walk across the graduation stage, gleaming with the warrior spirit of confidence.

Students and Graduate Studies

Mentoring good students makes the SGL's job easy. Because everyone on the team is the same grade, the SGL isn't in the students' chain of command. An SGL has no administrative authority over the students. This means that he relies on the students to act professionally. If they are late or skip class, they receive a counseling statement. Sometimes students make it obvious that they came to the ECCC solely to attain their master's degree. I told my students that I appreciated the fact that they wanted to continue their education, but my primary concern was that they master the blocks of instruction I was teaching. The ECCC is a priority, and their degree is second. The graduate program is a privilege, not a right.

International Students

As an SGL, I worked with soldiers from Romania, Saudi Arabia, Turkey, Macedonia, Portugal, Tunisia, France, Venezuela, and Egypt—just to name a few. These leaders are some of the best-of-the-best from their countries. They were extremely competent, dedicated, and willing to learn. I believe that the advantage of forming good relationships with these students is that we may work together again sometime, as part of a joint task force.

One of my roles was to ensure that our international students were always asked to share their experiences and opinions and were fully integrated into the team. I take my hat off to these patriachs. I don't believe that I could accomplish their awesome task: listen to instruction in English, convert it into their native tongue, and then produce answers in English.

The Future

With the many changes coming to Army institutional learning—from drastic changes in how we fight as engineers, to distance learning—what will happen to the SGLs? Will they become a collection of interactive disks or an icon from the past? For the soldier's sake, I hope not. The SGL brings so much to the learning experience. During my two years as an SGL, every after-action review at the end of the course had the same comment—keep the SGL concept.

Although becoming an SGL was not my first choice, I accepted the assignment because I wanted to make a difference. I can truly say that I have no regrets. The assignment was challenging and rewarding. When I discussed this with some of my peers, they concurred with my sentiments and added that it is a great job to improve tactical skills.

In retrospect, I asked myself, Can an SGL make a difference? To answer that question, consider this: I was an SGL for 9 teams, with 15 future commanders in each team. Each commander takes command of a company with approximately 100 soldiers. Well, I'm sure that you can do the math. The answer is simple—yes, they do make a difference. 

Major Parks is the Recruiting Officer and Executive Officer for the Central State University Reserve Officer Training Corps Battalion, Wilberforce, Ohio. Previous assignments include instructor/writer for the US Army Engineer School, Fort Leonard Wood, Missouri. Major Parks holds two master's, one in human resource development and one in management.

Endnote

¹The Engineer Captain's Career Course (ECCC) is now known as the Engineer Command and Staff Course (ECSC). (See the article on page 29.)

MOVING?

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The Survey Experience During Operation Iraqi Freedom

By First Lieutenant Vilen Ayvazov and Captain Aaron Wolf

In March 2003, the survey platoon of the 320th Engineer Company received orders to deploy to the Central Command (CENTCOM) area of operations and support Operation Iraqi Freedom. As the only V Corps geodetic survey element, the platoon was called to complete a very unique mission for an Army that depends on absolute positioning and the Global Positioning System (GPS) for fighting a high-technology war. The platoon deployed as a three-squad element, ready to support field artillery in the combat support role and the aviation assets in the airfield safety survey role. The platoon deployed a noncommissioned officer (NCO) with the company advance party, whose primary mission was to initiate survey planning and integrate assets early into the fight. Once the company main body arrived in theater, the platoon was tasked to immediately send a survey field enhancement module (SFEM) into the V Corps 41st Field Artillery Brigade (FAB). Once stability operations began, the surveyors switched missions to complete the geodetic safety surveys of the major airfields to be used by V Corps or coalition forces.

Geodetic Surveys

The SFEM's mission was to emplace horizontal and vertical survey control points (SCPs) in support of deployable weapon systems. The emplacement of benchmarks allowed artillery to receive exact positioning before firing, allowing for greater accuracy of fires, less ordnance

expended, and less collateral damage. The key to the SFEM's initial success was the planning and early deployment of the platoon leader with the company advance party. The company main body, with the survey platoon, arrived in theater on the first day of the ground war (28 March 2003). Coordination with the V Corps artillery staff officers emphasized the possibility and importance of the SFEM's abilities. Once the equipment arrived, the SFEM completed precombat checks, then convoyed north and linked up with the 41st Field Artillery Brigade. The first lesson learned was getting the geodetic surveyors into the theater early enough to allow additional planning, coordination, and linkup with the supported artillery. Because the deployment timeline did not allow the company to arrive any earlier, it was good to have at least one surveyor on the ground early.

Once the platoon linked with the 41st FAB south of An Najaf, the SFEM began a baseline for a third-order network (a third-order point provides an 8-digit grid coordinate). With the completion of the baseline, the artillery surveyors extended control with their own systems. One of the most memorable events was the battle at An Najaf where the artillery fired more than 20 missiles a day for three days. At this point the platoon was divided into three separate elements, which supported two subordinate battalions along with the brigade. The lesson learned was that the platoon needed to be flexible to support several units. Unfortunately, the element did not have enough

transportation or life support; therefore, the soldiers had to count on the support of the artillery for more than Class I supplies.

The most important we lesson learned from the mission was the necessity for speed. The cannons might be called to move at any moment (day or night). The SFEM had to be flexible to break camp and push out with the tactical road march to the next location and then immediately start tracking satellites to permit the artillery surveyors to extend control to allow greater accuracy.

Airfield Safety Surveys

Once the company arrived at Balad Airfield to collocate with the V Corps rear area, the SFEM initiated a Ron Brown safety survey of the landing strips at Balad, Tikrit, and Mosul. On 3 April 1996, an aircraft carrying Secretary of Commerce Brown crashed near Dubrovnik, Croatia. In response, then Secretary of Defense William J. Perry issued two directives relating to flight safety: install GPSs on military aircraft for flight safety, and require all military aircraft to fly Department of Defense (DOD) instrument approach procedures. The Ron Brown Airfield Initiative (RBAI) began after his death and the issuance of the Secretary of Defense directives. Critical aeronautical information needed to satisfy the directives is provided by the airfield initiative.

As the only survey asset in the European Command, the platoon was very experienced at planning, coordinating, and executing airfield survey missions. The basic survey was conducted in five phases: control points, topography, obstructions, picture points, and drafting. The platoon had

completed three airfields to date (Balad, Tikrit, and Mosul). Each airstrip provided unique challenges, teaching the platoon to be innovative.

- Balad Airfield, located at the corps rear north of Baghdad, was the first airfield and the largest to be surveyed by the platoon. The surveyors learned to emplace SCPs from tops of the larger hanger-bunkers, which allowed better observation and lowered the number of temporary points that were required from areas that could be observed.
- Tikrit Northwest Airfield, known as Al Sahra, was occupied by the 4th Brigade, 4th Infantry Division. The lesson learned from this operation was that coordination with other engineer forces was essential in obtaining unexploded ordnance (UXO) information. The airfield was littered with UXO, making planning and mission analysis of the platoon more critical. The platoon had to capture survey points without entering the off-limits areas.
- Mosul Airport, located on the southern outskirts of Iraq's most northern city, was occupied by the 101st Airborne Division (Air Assault). To date, this was the smallest, busiest landing strip. The platoon learned the importance of constant coordination with the air operations staff. During the busiest parts of the day, the platoon would work for 30 minutes, stop for a landing aircraft, and then resume the survey once more.

An important part of the mission was the transfer of data to and from the National Geospatial-Intelligence Agency (NGA), a critical partner and recipient of the data. It was essential for the platoon to have access to powerful computer systems for



A member of the SFEM sets up an antenna on a runway at Balad Airfield to conduct a Ron Brown safety survey. The survey helped provide a safer environment during airfield operations.

transferring information; however, this was sometimes difficult, because the company did not have its own systems. NGA was very fast at processing the critical data, ensuring that the platoon did not have to wait.

Final Thoughts

Although the platoon conducted many airfield surveys at its home station in Germany, it did not have to compete with either the desert environment or busy military usage of airfields as it did in Iraq. The platoon learned many new techniques while working in the austere desert environment, as well as while working around the active airfield operations to complete their survey. Fortunately, the equipment was well constructed, and it protected the instruments from water; the sand was not a major concern for the operation.

The survey platoon was a unique asset within V Corps. It provided direct survey control to the artillery unit and a safety survey for the airfields. Without the platoon's expertise, the artillery would not have been as accurate and the aviation

assets would have been at a greater risk. The platoon learned several lessons as it integrated as part of a combined arms team. The surveyors gained valuable military occupational specialty experience from Operation Iraqi Freedom. 

First Lieutenant Ayvazov is the 565th Engineer Battalion maintenance officer. He previously served as a platoon leader for the 502d Engineer Company (MRB) and as survey platoon leader of the 320th Engineer Company during the Operation Iraqi Freedom ground war.

Captain Wolf is the company commander of the 320th Engineer Company (Topographic), 130th Engineer Brigade. He previously served as the brigade maintenance officer, 130th Engineer Brigade; the regimental engineer, 1-4 Infantry (OPFOR); a platoon trainer for the Engineer Officer Basic Course, 554th Engineer Battalion; and platoon leader, 19th Engineer Battalion. Captain Wolf holds a bachelor's in cartography from the University of Wisconsin-Stevens Point and a master's in engineering management from the University of Missouri-Rolla.



Enlisted Personnel Notes

Reclassification of Soldiers in Selected MOSs

By Major Ruben Matos

The Army continues to reshape and adjust its personnel structure to meet changing requirements. One method is to precisely target specific military occupational specialties (MOSs) within the enlisted soldier population for MOS realignment. This helps ensure unit readiness and the ability to man the force with the right soldiers, in the right place, at the right time. As we transform to a more modular force and begin to initiate force stabilization, all the while continuing with our high personnel tempo, we cannot afford to maintain MOS imbalance; otherwise, unit readiness across the Army will suffer. To help fix these potential problems, the US Army Human Resources Command (HRC) has begun targeted MOS reclassification, moving soldiers from overstrength to understrength MOSs.

Efforts are underway between HRC and the applicable branch proponents to initiate necessary reclassification for soldiers currently serving in nine overstrength MOSs—two of which are 21B combat engineer and 21J general construction equipment operator. Selected soldiers serving in the targeted MOSs—who meet MOS qualification requirements for their newly selected understrength MOS—will receive a letter from HRC directing their reclassification.

The numbers needed to reclassify out of and into an MOS will vary based on the needs of the Army.

Soldiers selected for reclassification by HRC will benefit in the long run since moving soldiers into an understrength MOS will expand their opportunity for promotion and career-enhancing assignments. The Army will increasingly rely on mandatory reclassification of selected soldiers to meet unit manning guidance. Soldiers in MOSs that are overstrength are encouraged to voluntarily seek reclassification as a way to stay competitive for promotions and professionally rewarding assignments. The mandatory reclassification effort will continue, and the number of MOSs affected is likely to expand as additional force structure changes are implemented.

The point of contact is Ms. Connie Marche, Chief, Reclassification Management Branch, Enlisted Personnel Management Directorate, (703) 325-6845 or DSN 221-6845.

Major Matos is chief of the Training Analysis Management Branch, Enlisted Personnel Management Directorate, US Army Human Resources Command, Alexandria, Virginia.

HAZARDS OF CRYSTALLINE SILICA

By Mr. Fred Fanning

Silica, a common mineral in the earth's crust, is a major component of sand, rock, and mineral ores. Breathing dust that contains microscopic particles of crystalline silica is a serious health concern. It can cause scar tissue to form in the lungs, reducing the lungs' ability to extract oxygen from the air they take in and causing a disease known as silicosis.

There are three types of silicosis: chronic, accelerated, and acute. The most common type—chronic silicosis—is a uniquely occupational disease resulting from moderate exposure to crystalline silica over a long period of time (10 years or more). The disease can be progressive and disabling and can lead to death. According to the Occupational Safety and Health Administration (OSHA), 1,400 people died of silicosis from 1990 through 1996.

Exposure to crystalline silica also may increase the risk of developing tuberculosis and other nonmalignant respiratory diseases and contribute to renal and autoimmune respiratory diseases. In addition, the International Agency for Research on Cancer has designated crystalline silica as a known human carcinogen.

In spite of the dangers, OSHA reports that more than two million workers are regularly exposed to crystalline silica dust. For example, many construction activities—such as highway repair, masonry and concrete work, and rock drilling—expose workers to silica. For engineer soldiers, exposure to this hazard may occur when drilling rock, cutting concrete and other masonry products, and blasting.

Engineering controls for this hazard, such as exhaust ventilation and blasting cabinets, are very cumbersome and may not be feasible. So the next option available to Army engineer leaders to protect soldiers is to control their exposure by rotating them as much as possible. Leaders may also consider using a respirator program, as outlined in Title 29 Code of Federal Regulation 1910.134 (29 CFR 1910.134) and Army Regulation 11-34, *The Army Respiratory Protection Program*. Army engineer leaders also should ensure that soldiers are informed of the following items as they relate to working with silica:

- Hazards/illnesses that may be caused by exposure
- Proper conditions and precautions for safe use or exposure
- Nature of operations that could result in exposure
- Safe work practices for its handling, use, or release
- Proper housekeeping practices
- Purpose, proper use, and limitations of respirators
- Increased risks from combining smoking and exposure

When leaders cannot reduce exposure to silica by limiting the concentrations, they must use a program of respiratory protection to protect every soldier who is exposed. This process

begins with identifying soldiers who will need to use a respirator and getting them a physical to ensure that they can properly wear one. Soldiers are then fitted with an appropriate respirator and trained on its use and maintenance. A safety specialist assigned to the organization can assist in these steps.

When soldiers have been exposed to dust that contains silica, their battle dress uniforms or coveralls should be vacuumed. They should not clean their clothes by blowing or shaking them. In addition to clothing, exposed surfaces should be kept free of silica dust. If the dust on these surfaces is disturbed, it could become airborne and breathable. Dry sweeping and using compressed air for cleaning floors and other surfaces should be prohibited. When vacuuming is used, the exhaust air from the vacuum should be filtered. Gently washing the surfaces is preferred, when practical. All food, beverages, tobacco products, nonfood chewing products, and unapplied cosmetics should not be used in work areas with silica dust. Soldiers should also be able to wash their hands with soap and water after exposure.

In addition to the hazards associated with being soldiers, Army engineers face the many hazards of their civilian counterparts. This article provides leaders with the basic knowledge to make informed decisions concerning steps necessary to prevent or control exposure to one of the hazards—working with crystalline silica. Although engineer leaders cannot control all the hazards that soldiers face, controlling this one could prevent needless illness to the Regiment now and in the future.

Additional information may be obtained from <http://www.osha.gov/SLTC/constructionsilica/index.html>. There are also a number of products that can be downloaded from <http://www.osha.gov/SLTC/constructionsilica/recognition.html>.



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References

Occupational Safety and Health Administration Semiannual Regulatory Agenda, 68:73196-73228, Sequence Number 90 in part II, 1218-AB70-2103, "Occupational Exposure to Crystalline Silica," 22 December 2003.

Occupational Safety and Health Administration Instruction CPL 2-2.7, 30 October 1972.

Title 29 Code of Federal Regulation 1910, Section 134, "Respiratory Protection," 23 April 1998.

Army Regulation 11-34, *The Army Respiratory Protection Program*, 15 February 1990.



Photo courtesy Mr. Mark Crabill, Office of the Chief, Army Reserve

By Major Ron Eschmann

"...We must, I repeat, we must land at Beirut! We must land at Beirut! No alternative..."

"...They are beating the passengers. They are threatening to kill the passengers. We want fuel now! Immediately! Five minutes at most, or he is going to kill the passengers..."

"...He just killed a passenger! He just killed a passenger!..."

— Cockpit communications between TWA Flight 847 pilot and the Beirut control tower

On 14 June 1985, following a temporary tour of duty in Egypt, an Army Reserve civil engineering support planning officer from the 416th Engineer Command, boarded TWA Flight 847 bound from Athens to Rome. He was anxious to get back to spend his first Father's Day with his wife and newborn child. On the same flight were two armed Hezbollah members with other plans. Soon after takeoff, the soldier wasn't sure if he would even be alive the next day.

At the Army Reserve's 416th Engineer Command in Chicago, the call was out: Officers needed for a predeployment site survey on an upcoming training exercise called "Bright Star." Held in Egypt, Bright Star was a joint tactical exercise involving thousands of multinational troops. Army Reserve Major Kurt Carlson, a Rockford, Illinois, roofing and building contractor, was subsequently selected for the anticipated week-long trip.

To Carlson, overseas trips were always an adventure, and he looked forward to them. "To be successful, you needed to hit the ground running to complete a lot of work in a limited period of time and," he said prophetically, "maintain a low profile."

Following several days of liaison duties with the Egyptian military and US Army Central Command officials, the site survey, and a tour of the Giza pyramids on camelback, Carlson now had time to call Pan American Airlines to confirm his return flight. He was looking forward to experiencing his first Father's Day. He called his wife to let her know he would be in Chicago on Friday, 14 June.

Flights from Cairo to other connecting hubs had changed, said the Pan American representative on the crackling hotel telephone. Carlson thought he might have better luck at the Cairo airport. It turned out that it was no better. Fate seemed to be preventing him from getting back to Chicago on time. That was until a beaming ticket agent with a

sense of mission accomplishment told him that he got him the last seat on TWA Flight 847 from Athens to Rome. From Rome, he could make a New York connection.

As the TWA Boeing 727 aircraft headed toward Athens from Cairo to take on additional passengers, the home-bound soldier considered himself fortunate.

Deplaning briefly before the next leg of the trip to Rome, Carlson noted alarmingly the lack of security at the Athens passenger control point—disinterested security guards and malfunctioning equipment. More disturbing was the fact that there had been two air hijackings in the region within the past week. Carlson recalled that when they traveled overseas, they always used US airlines for security purposes. At that time—1985—they had little training in dealing with a terrorist hijacking or kidnapping—only prisoner-of-war training.

Filled mainly with American tourists, the TWA aircraft—carrying 145 passengers and 8 crewmembers—finally took flight midmorning on 14 June, about an hour and a half late. As the aircraft gained altitude, all appeared normal as passengers became comfortable in their surroundings. Some rustled in their seats, others talked, some started to read—no different than any other standard aircraft takeoff.

The false sense of normalcy in Carlson's world immediately changed when the flight engineer turned off the cabin "Fasten Seatbelt" sign. Almost instantaneously, two well-dressed men in white suits with black shirts rushed the cockpit door, waving weapons. One of them had a fragmentation grenade in his hand, and he was frantically pulling at the pin. They both screamed repeatedly, "Come to die! Americans die!"

One of the hijackers viciously kicked a German-American flight attendant in the chest, which slammed her against the aircraft bulkhead and—in an "I-dare-you" motion—held a chrome-plated, 9-millimeter pistol to her ear. The hijackers were later identified as Mohammad Ali Hamadei and Hasan Izz-Al-Din, both belonging to a Lebanese Hezbollah faction. Hamadei, who was fluent in German, brandished the pistol and shouted at the attendant in her native language, while simultaneously pounding on the door of the pilot's compartment.

"They're on a suicide mission," thought Carlson. His first reaction was to want to try to overpower them. He unfastened his seatbelt and stood up, but noticed that no other passenger contemplated the same action. Carlson did note the sheer terror on their faces. Realizing he couldn't take on two armed fanatics who could blow the aircraft out of the sky, the Reserve engineer sat back down. "There may even be others on the plane," he reasoned.

(Note: In fact there was a third hijacker Ali Atwa, who was arrested by Greek police at the airport just prior to boarding. Later released by the Greek

authorities, Atwa is still listed by the FBI as one of the most wanted terrorists for his role in the hijacking.)

By this time, Izz-Al-Din, who held the fragmentation grenade, had forced his way into the cockpit. Soon after this forced entry, the pilot announced over the aircraft address system that their new destination was Beirut, Lebanon. Following the pistol-whipping of some of the flight crew, the hijackers subsequently went from row to row, collecting passports from the passengers.

Carlson's actions turned to hiding his military identification card in the airline seat cushion while at the same time worrying about his passport and other official papers in his briefcase located in another section of the aircraft. Carlson figured that if they searched him and found the identification card, he would have no opportunity at all to jump them at some future point, because they would have either separated him from the rest of the passengers or killed him right there. He thought he would try to buy some time in order to help at any opportunity. As an Army Reserve officer, he knew he had an obligation to do whatever might be required of him to help protect the other passengers and possibly overpower the hijackers, even at a risk to himself.

Hamadei waved his pistol and barked orders in German to the flight attendant, while Izz-Al-Din jumped up and down and made threatening gestures. The flight attendant spoke to the passengers, "Please, no talking. Put your heads down and clasp your hands over your heads... We must do exactly as we are told." The aircraft became deathly quiet. After hours in this contorted face-down position, muscles began to cramp and ache, but passengers who made a noise or complained were severely beaten.

In what became a macabre game of musical chairs at gunpoint, men were placed in window seats and women and children were forced to sit in aisle seats in order to limit the threat to the hijackers. Additionally, passengers in the forward

area of the aircraft were moved to the rear, armrests were removed from the seats, and four people were crammed in the three-seat rows.

From his seat, Carlson could hear the hijackers hysterically yelling, "Marines!" and "New Jersey!" He could hear other military members trying to explain that they were US Navy construction divers, not Marines.

(Note: Why did they use the terms "Marines" and "New Jersey"? In 1983, the 24th Marine Amphibious Unit had been sent to Beirut to support the Lebanese armed forces. On 23 October, a truck filled with 2,500 pounds of TNT, driven by members of the Free Islamic Revolution Movement, crashed through a gate at the Beirut International Airport and came to a stop next to a four-story building and exploded, resulting in the deaths of 241 US Marines. In 1983 and 1984, the battleship USS New Jersey fired her massive 16-inch guns at hostile antiaircraft positions inland of Beirut with highly effective results.)

Carlson's luck ran out when the hijackers finally discovered his official passport, which he used on military travel. Maniacally screaming "CIA! FBI!" the pistol-carrying Hamadei pointed his chrome-plated weapon in the major's face. "Tell him I'm in the Army Reserve and am only on a one-week tour of duty," he told the flight attendant. Temporarily satisfied that he was not a CIA or FBI operative, the hijacker moved on to intimidate and bludgeon other passengers.

Beirut International Airport officials wanted no part of this escalating international incident, so with the assistance of local militia, they decided to block the runways with barricades. Someone at the control tower subsequently told the pilots that the airport was closed. As if matters couldn't get worse on the ground, a rival militia had engaged the militia putting up the runway obstacles in a firefight. The attacking militia, called the Muslim Amal, ultimately cleared the runway for the aircraft with no time to spare.



Major Kurt Carlson and his wife are greeted by President Ronald Reagan at Andrews Air Force Base, Maryland, upon Carlson's return to the United States after being held hostage in Beirut, Lebanon.

As the 727 was taking on fuel, the hijackers singled out one of the Navy divers. Grabbing him from his seat, they pushed him to the forward compartment.

Following refueling, Hamadei and Izz-Al-Din demanded to be flown to Algiers. The aircraft reeked at this point—nearly five hours from the initial takeover—from nauseating odors. And for the passengers, it became difficult to breathe. The stench became worse after landing in Algiers as the aircraft sat on the runway in sweltering Middle East heat. Sweat poured off of the hostages, and passengers gasped for air. Other passengers—children and some of their mothers—were released by this time.

Carlson felt a tap on his shoulder and turned around. He again faced the agitated Hamadei and his chrome-plated pistol. The Reserve officer was subsequently forced to the forward compartment, just inside the aircrew cabin area. He remembered that this was the same thing that had happened earlier to the young Navy diver who now remained unaccounted for.

Carlson was blindfolded with a vomit-smelling bandana, and his hands were bound tightly behind his back with a silk

tie—so firmly that it cut into his wrists and numbed his hands and arms. One of the hijackers pushed him just inside the pilot's compartment and proceeded to severely beat him with a steel pipe. He heard the chief pilot talking to the Algiers control tower, "They're killing people and beating them." At the same time, both Hamadei and Izz-Al-Din began kicking him, trying to make him scream in order to get the aircraft refueled again. Carlson, though badly injured, could not feel the kicks because his body was going numb. He prayed that he could survive the pain and the injuries he was receiving.

The hijackers also started making demands that Shi'ite prisoners in Kuwait and Israel be freed. The situation got even worse when they began screaming over and over, "One American must die!"

In a surreal world of pain and peace, Carlson heard a strange sound: click-click, click-click. It took him a moment to realize that the aircraft pilot was keying his handheld microphone nearby. Carlson now realized his part in this brutal reality radio script: The pilot wanted to let the airport control tower hear his screams to let them know the hijackers

were ruthlessly serious. The tower officials were just part of the audience. Hamadei and Izz-Al-Din wanted the world to know that they were willing to kill a passenger. To buy time, Carlson forced himself to yell out, and the continuous beating slowed down.

"Where is the fuel," demanded the agitated pilot. "Your fuel is coming," said the noncommittal voice in the tower. At this perceived delay, Hamadei and Izz-Al-Din began kicking Carlson in the head and spine. The ordeal continued for more than an hour and a half before they put the pistol to Carlson's head and screamed "one American must die!" before giving a 10-minute deadline. Carlson thought of his family and his personal affairs and resigned himself to the inevitable.

The pilot announced that he could see the fuel truck and, for the time being, the officer was spared.

Although Carlson had been beaten very badly for more than 2 hours, he had survived. It was a miracle that the fuel had come just before the hijacker was going to shoot him—an answer to a lot of praying. Several discs in his back were injured, he had broken ribs and fingers and internal and external bleeding, and he had lost a lot of blood. There was head swelling and injuries, blurred vision, mouth and tooth damage, shoulder welts, and difficulty using his hands and arms.

Late that night, the aircraft again headed to the Beirut Airport. The controllers there had once again refused permission to land, but then they gave in to both the hijackers' demands and the pleading of the pilot, who matter of factly stated that they had only 5 minutes of fuel left on board. After a very rough landing, the hijackers made further demands. At this point, they dragged the Navy diver to the door of the aircraft, shot him in the head, and dumped his lifeless body onto the Beirut airport runway.

The pilot began screaming to the tower over his radio that a passenger had just been killed, and one of the hijackers said that there would be another in 5 minutes. Beirut airport officials soon complied with their demands.

The passengers and aircrew pondered on what was the next terror that awaited them. After some additional heated radio discussions with the tower, the tail door of the airplane opened and on rushed a number of shouting and heavily armed militia members, who ran to Hamadei and Izz-Al-Din and hugged them. With the militia weapons pointing at them, Carlson and four of the Navy divers were taken off the aircraft to an awaiting truck, and they sped off to face another nightmare. Following refueling, fresh water, and food, the aircraft departed for Algiers.

The military hostages were taken into a battle-scarred building located near a Palestinian refugee camp and forced into a 12- by 20-foot basement cell with a steel door and bars on the window. As the senior officer, Carlson took command of the small military unit. Still nursing his injuries, he instructed his fellow hostages to learn as much as they could about their environment, the language, and their Hezbollah-connected militia guards. They were given a small radio, which was not only their source of news but also a source of frustration. They subsequently found out via BBC broadcasts that there were small clusters of 39 of the original 145 passengers and crew scattered throughout the city. The hostages could also hear how tenuous, painstaking, and slow the negotiations were. Days went by, and they were still unsure of their ultimate fate.

Although Carlson was badly injured, the Navy divers who were in the cell with him helped him survive. Together, they figured out their location in Beirut in relation to the airport and the sea. They learned their guard's strengths, weaknesses, and routine, and they developed a plan for escape. They would have likely made an escape within a few days after their capture if other hostages had not been taken and held in Beirut. The soldiers didn't want to jeopardize the lives of the other hostages, since negotiations were underway for release of the entire group.

As the military hostages waited in their cell, they occasionally felt the impact of mortar explosions or the

ricochet of bullets, which added to the tension of their captivity. They began to worry that the shell-pocked building they were in might fall in if an explosion was close enough.

On 25 June, after much diplomatic and political negotiating, Carlson's group was driven to a three-story yellow schoolhouse that was filled with their fellow passengers. Some of them were shocked to see that the officer was still alive. From there, they were moved to a hotel on the Lebanese coast. Here, they met with Red Cross officials and the international news media and learned that they would be crossing into Syria.

At the Damascus airport was a sight that will be forever burned into Carlson's memories—a US Air Force C-141 aircraft that would take them to military facilities in Germany.

After being released from captivity and flown to Wiesbaden, they were interviewed by Navy psychiatrists. Carlson couldn't talk about the hijacking and captivity. It was all there in his mind, but it wouldn't come out. He needed to clear his mind of the terror and somehow find some good from the experience.

Returning home, Carlson chose to stay in the Army Reserve. As part of his recovery, he assisted in educating the military about terrorism. He gave many talks and even wrote a book, *One American Must Die*. In 1987, he returned to Germany to identify one of the hijackers who had been captured and later testified at his trial.

(Note: Mohammad Ali Hamadei was arrested by German authorities in 1987. He was convicted by a German court and sentenced to life imprisonment. Hasan Izz-Al-Din and Ali Atwa are still at large, as shown in the Web sites listed at the right.)

Carlson later served during Operation Desert Shield and Desert Storm during 1990 and 1991. He concluded his Army career in 1998, following 3 years of command of the 961st Engineer Battalion (Combat) (Heavy).

"Through my 29 years of duty, I was a true Reservist," said Carlson. "I never

sought an assignment or position, but volunteered when asked to serve. It was an honor and a privilege to be a member of the Army Reserve in service of our country." Reflecting on the current world situation, he stated, "My support and prayers will always be there for Army Reserve soldiers and their families."

(Note: In 1995, a guided-missile destroyer was named for the slain petty officer, Robert Stethem. From 2000 through 2002, Carlson and the Navy divers, along with the family of the slain diver, took the Iranian government to court for planning, sponsoring, and training the terrorists who conducted the hijacking. They won a landmark case against Iran and state-sponsored terrorism.)



Major Eschmann is a staff officer assigned to the Office of the Chief, Army Reserve, Washington, D.C.

(Editor's note: In October 2003, a version of this article was published in *The Officer*, the official publication of the Reserve Officers Association.)

For additional information on the Flight 847 hijacking:

Books

Kurt Carlson. *One American Must Die: A Hostage's Personal Account of the Hijacking of Flight 847*. New York: Congdon and Weed, 1986.

John Testrake and David J. Wimbish. *Triumph Over Terror on Flight 847*. Old Tappan, New Jersey: Fleming H. Revell, 1987.

Video

The Taking of Flight 847: The Uli Derickson Story (1988) (TV Movie).

Internet

FBI's Most Wanted Terrorists, Hasan Izz-Al-Din, <<http://www.fbi.gov/mostwant/terrorists/terizzaldin.htm>>.

FBI's Most Wanted Terrorists, Ali Atwa, <<http://www.fbi.gov/mostwant/terrorists/teratwa.htm>>.



Soldier's Creed

**I am a Warrior and a member of a team.
I serve the people of the United States and live the Army Values.
I will always place the mission first.
I will never accept defeat.
I will never quit.
I will never leave a fallen comrade.
I am disciplined, physically and mentally tough, trained,
and proficient in my Warrior tasks and drills.
I always maintain my arms, my equipment, and myself.
I am an expert, and I am a professional.
I can stand ready to deploy, engage, and destroy
the enemies of the United States of America in close combat.
I am a guardian of freedom and the American way of life.
I am an American Soldier.**



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Clear The Way

By Major General Randal R. Castro
Commandant, US Army Engineer School



I am excited to serve our Regiment and our Soldiers as your new Commandant. I couldn't be more impressed with the work done by my predecessor and good friend Lieutenant General Van Antwerp. He and his lovely wife Paula have left a positive mark on our Regiment, our Soldiers, Fort Leonard Wood, and the community. Judy and I express our thanks for this inspirational command team, and we wish them continued success.

I would like to thank Brigadier General William (Bill) McCoy as the Assistant Commandant for the US Army Engineer School (USAES) and Command Sergeant Major Clinton (Clint) Pearson for their actions as well. Brigadier General McCoy has led a team in the challenging task of laying the groundwork for the Future Engineer Force that will support the needs of America's current and future military forces. Command Sergeant Major Pearson continues to be the long arm of the Regiment. He wraps up all we do, takes our message to the units, and brings their great ideas and enthusiasm back here to the home of the Regiment. And they are only a part of our Team of Teams here at Fort Leonard Wood, which includes our TRADOC teammates here at MANSCEN—the Military Police and Chemical Schools; our Joint teammates—Navy, Marines, Air Force, and Coast Guard; and our Foreign Liaisons. Our Regimental Team includes the US Army Reserve and Army National Guard, US Army Corps of Engineers (USACE), the Office of the Chief of Engineers at the Pentagon, and most importantly, our Regimental units and you—the Engineer Soldier. We are all connected in our Team of Teams.

The excellent reputation our Regiment maintains is due to the heroic acts our Engineer Soldiers execute on a daily basis, supporting our Nation at War. Our Regiment is making a positive difference—our Nation salutes you. We continue our diligent work here to address emerging threats such as improvised explosive devices (IEDs), but much lies ahead. The work of our IED Defeat Task Force and others will be in our next issue of *Engineer*, as well as the other topics we will take on at ENFORCE 2005.

The Future Engineer Force will be a part of that discussion. For now, all I will say is that the future is bright. Our Regiment is totally revamped from bottom to top, based on capabilities needed to support our Army and Nation. We need to be prepared to embrace the significant changes in the landscape of the Army and the Engineer Regiment of the future. We are confident in the knowledge that there remains a need for Engineers, and as a Regiment...“We're coming back.”



Engineers will have key roles in how the Future Force operates, fights, and wins our Nation's battles. While the engineers' expertise and experience will be utilized across a broad spectrum of tasks and missions, this issue of *Engineer* will focus on one mission not widely recognized outside of the Engineer Regiment—our environmental mission.

The Engineers are the Army's environmental integrator, with the USAES as TRADOC branch proponent. It is through the efforts of organizations like the USAES and USACE that doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) solutions to both environmental threats and issues are being addressed. Positions such as the Staff Engineer, Army Reservists on Facility Engineer Teams, and the USACE—as well as its Forward Engineer Support Teams/Environmental Support Teams and USACE laboratories—provide the on-site and reachback expertise to address environmental issues/considerations as required. The Army Environmental Center also acts as a significant resource to address environmental issues and concerns.

Direct environmental threats that the USAES and USACE are addressing include dust suppression, solid waste management, and initial environmental screening for force protection. The USAES Directorate of Environmental Integration assisted ARCENT CFLCC environmental staff in writing and sponsoring an operational needs statement to address waste oil generation as part of operational activities. By eliminating waste oil, the need for backhauling of this waste is removed, and the solution—fuel oil blending—also reduces the fuel needs of the operation.

Recognizing environmental considerations, impacts, and threats is not something new, but it is something that will have to be taken more seriously as the Current and Future Force continue to perform their mission of safeguarding this Nation. It falls on the Engineers to lead the way forward through our actions and continued execution of our propensity. As we safeguard the security of the environment, we in turn safeguard our Nation's security.

In closing, I say again how thankful I am to be back with the Regiment, serving alongside such great Soldiers and leaders. I know you are all busy, and I just ask that with such a fast tempo, you continue to balance your work requirements with your commitment to your family and community. Let's make it a Great New Year. Essayons!

Lead The Way

By Command Sergeant Major Clinton J. Pearson
US Army Engineer School



Happy New Year to all of our engineer soldiers and families! As we reflect on the accomplishments and happenings of the past year, let's all stop for a minute to think about the tremendous contributions and sacrifices made by our Active, Guard, and Reserve soldiers and their families during this time of war. Whether it's doing the job overseas, preparing to deploy, training soldiers, designing the Future Force, developing equipment, or ensuring that the home front is being taken care of, sacrifices are being made around the clock. As a result, Iraq today is much better than the Iraq of yesterday; and the principle of freedom is being upheld throughout the world. We're seeing on a daily basis that freedom is definitely not free. So I want to say thank you to those who are fighting for it—our soldiers—and to our families for supporting us.



A great deal has occurred since the last issue of *Engineer*. One of the most significant events was the change of command between General Van Antwerp and General Castro. I'd like to express my appreciation to the Van Antwerps for the positive impact they made on the Engineer Regiment and the Fort Leonard Wood community. It was great to have served with such a fine team, and I know the Regiment and I speak with one voice when I say, "We wish you the very, very best." I speak for the Regiment again when I say, "Welcome home, General and Mrs. Castro! It's great to have you back. We sincerely look forward to serving with you and are blessed to have another extraordinary team in our midst."

Fort Leonard Wood and the Engineer School received a welcome visit from the US Army Training and Doctrine Command (TRADOC) Command Sergeant Major Anthony Williams in October 2004. He toured the Noncommissioned Officers Academy (NCOA) and Drill Sergeant School and visited the Sapper Leader Course (SLC), where he gave a briefing on the significance of authorizing the Sapper Tab, TRADOC issues and concerns, and general leadership.

Soldiers from the NCOA, Officer Basic Course, and 1st Engineer Brigade at Fort Leonard Wood also had the opportunity to attend a presentation by the 1st Armored Division Engineer Brigade Command Sergeant Major Ioakimo Falaniko. He shared lessons learned in Iraq and stories of personal courage and leadership on the battlefield. He was also the guest

speaker for the SLC Class 01-05 graduation, and helped pin the first set of Sapper Tabs on the graduates.

During my recent trip to Fort Bragg, North Carolina, I visited the 307th and 20th Engineer Brigades—commanders, command sergeants major, and soldiers at all levels—and pinned Sapper Tabs on eligible soldiers from the 27th Engineer Battalion and 307th Engineer Brigade.

TRADOC Commander General Byrnes has approved the concept to close the gap between explosive ordnance disposal (EOD) personnel and engineers. Part of the concept is a new additional skill identifier (ASI)

for engineers to enable us to identify and destroy (on a limited basis) explosive hazards. This will involve training selected 21Bs as explosive ordnance clearance agents (EOCA). Explosive ordnance clearance is defined as the investigation, detection, location, marking, reporting, and preparation of protective works for unexploded ordnance (UXO). It also includes the disposal in place—when authorized by the EOD staff cell—of UXO identified in draft Technical Manual 093-89D-02, *Explosive Ordnance Clearance Manual*, and theater-specified UXO, after risk analysis and positive identification. There will be 192 seats available per year for the EOCA course, with priority going to deploying units. The pilot course begins on 1 March 2005 at Redstone Arsenal, Alabama, with 16 Army Training Requirements and Resources System (ATRRS) seats available for reservation starting 1 December 2004. Students must be command-selected based on prerequisite criteria, and their unit must fund the TDY cost. If you would like some of these seats, contact Sergeant Major Benton, USAES Directorate of Training and Leader Development, as soon as possible. We will be conducting a Regiment-wide search to identify E7-level personnel (two each) to serve as instructors at this course, starting summer 2005.

I'd like to remind you that we're nearing our annual ENFORCE Conference, which will be held in late April 2005. Come prepared to share lessons learned and recommend suggestions for the way ahead so our Regiment can continue to progress as it did during 2004.

Finally, continue to focus efforts on the Global War on Terrorism, maintaining high standards and leading the way as engineers do. May God bless the fallen comrades and keep watch over our sons and daughters as we continue to fight the fight. Essays!

Soldiers Help Preserve Archeological Sites

By Sergeant Sean Kimmons

Some 4,000- and 5,000-year-old artifacts from Iraq's multicultural past were discovered on Kirkuk Air Base, in Iraq, when soldiers of a Reserve engineer battalion dug into a hill while gathering dirt for defense barriers. Once the engineers found the artifacts, they stopped, backed off, and notified the brigade tactical operations center. The next day, an officer—who was an anthropology major from St. John Fisher University—went to the site to verify whether or not it was an archeological find. The hill was validated as an archeological site, as were the nearby hills in the vicinity of the base. It's amazing that soldiers can step outside their living quarters and be at the doorstep to ancient civilization. US soldiers are operating in and protecting this birthplace of civilization.

Throughout the month of May, local archeologists from the Museum of Antiquities were invited on base to identify artifacts and other potential archeological sites. As Americans, our policy is to respect the cultures of the countries we are in. That's one of our main missions in civil affairs. The Director of the Ministry of Antiquities,

who appreciated the efforts of the Army and Air Force in safeguarding Iraq's ancient history, stated through an interpreter, "I realize how sincere [the Army and Air Force] are to the Iraqi culture. Before I knew about this, I was concerned about the sites beneath the earth in the area. Now I know they are here trying to protect and preserve these sites for the Iraqi people."

At first, the site was believed to be a grave site. Closer examination revealed that its animal bones and pottery were related to an ancient settlement and not a contemporary mass grave. Some of the pottery found on the base is about 5,000 years old and linked to the Yorghun Tepe or Nuzi people of the Hurrian civilization.

Nuzi was a provincial agricultural town in the small Hurrian kingdom of Arrapha, whose capital is today buried under Kirkuk. Arrapha was situated along the southeastern edge of the area under Mittanian domination. Babylonia laid to the south and to the west was Assyria, whose revolt against the Hurrian kingdom of Mittani probably led to



Pottery pieces found on Kirkuk Air Base, Iraq

Nuzi's destruction in the 14th century and ultimately contributed to Mittani's collapse.

In 1927, Harvard University excavated the town of Nuzi, which is about 10 miles south of Kirkuk. One remarkable item recovered from this site was the world's oldest map, which was etched on rock dated at 5,500 years. The Iraqi territory was known as Mesopotamia, which is credited as being the cradle of civilization and its inhabitants as the initiators in the development of the agricultural system, a writing system, and metal alloys.

Iraq is a country sitting on top of the world's oldest and most significant history of mankind. This is why it is important to safeguard these particular sites on base until the Ministry of Agriculture in Baghdad decides what to do with them. For now, it will be our responsibility to make sure no damage is done to the sites.

Sergeant Kimmons is a photo-journalist for the 2d Brigade Combat Team, 25th Infantry Division (Light), at Kirkuk Air Base, Iraq. He is a graduate of the Defense Information School at Fort Meade, Maryland.



Examining ancient artifacts discovered on Kirkuk Air Base, Iraq

"One-Stop" Waste Disposal – Enhancing Force Protection in Afghanistan

By Lieutenant Colonel Garth Anderson and Lieutenant Colonel Whitney Wolf

Sound environmental practices in the theater of operations, principally hazardous and solid waste management, are truly an area of force protection. How much waste can a contingency base camp generate? Seemingly more than it can handle. By Spring 2002, units at Kandahar Airfield, Afghanistan, were faced with a growing human health and environmental threat caused by huge amounts of waste that required collection, management, and disposal. This waste, not just from US forces, included vast amounts of destroyed equipment, trash, and hazardous waste left behind by Taliban forces that were routed away from the airfield.

Uncontrolled Waste Disposal

During the initial stages of base camp development, there were no easy disposal solutions. Most of the land in and around the airfield was potentially laden with mines and unexploded ordnance (UXO), which meant waste collection, consolidation, and disposal activities were limited to cleared locations close to soldier living and work areas within the camp. Off-site disposal was not an option since the local population was still unfriendly, and local disposal facilities did not exist. The first disposal area at the airfield consisted of a shallow trash burn pit surrounded by a large junkyard of old Soviet equipment, barrels of hazardous waste, discarded US materiel, trash, and small-caliber ammunition. This disposal site was uncontrolled, and many



Hazardous waste disposal at the old burn pit

items—regardless of their potential hazard or reuse value—were thrown into or around the burn pit. The uncontrolled nature of the disposal area created a number of unacceptable conditions:

- Soldiers entering the area to dispose of waste were at risk for potential exposure to smoke from burning debris, exploding aerosol cans and food containers, and unknown hazardous waste.
- The burn pit's proximity to the center of the camp allowed smoke to drift over living and work areas, creating a potential risk to soldier health.
- Hazardous waste (primarily petroleum, oil, and lubricant [POL] products) was uncontained, allowing the possible leaching of contaminants into the groundwater. Since the airfield depended on a single well to supply all of its nonpotable and most of its potable water, this threat was unacceptable.
- Soldiers threw nonburnable debris into the burn pit, causing it to fill up quickly and resulting in the need to dig a new emergency pit.
- Units discarded and destroyed large amounts of reusable or recyclable material (such as lumber, vehicle parts, equipment, metals, and concertina wire).
- The area was used for improper disposal of medical waste.



Abandoned Soviet military equipment near the old burn pit

In April 2002, Facility Engineer Team (FET) 18 of the US Army Facility Engineer Group (USAFEG) arrived at Kandahar Airfield and joined the staff of the Brigade Combat Team. The FET was manned by seven engineering, environmental, and construction professionals and was augmented by a US Army Corps of Engineers liaison officer. After setting up public works operations at the camp, the FET and the brigade staff began preparing the base master plan. A key component of this plan was environmental management, especially the collection and disposal of hazardous and solid waste. Given the conditions of the waste disposal area, commanders agreed that environmental management was a force protection issue and gave it the appropriate priority.

Several challenges faced the FET as it gained control over the waste management issues:

- Land for a new disposal area had to be cleared of mines and UXO.
- An upcoming transfer of authority between Brigade Combat Teams meant that departing units would be generating enormous amounts of waste as they cleaned and loaded equipment.
- Large amounts of improperly disposed of hazardous waste still needed to be collected and contained.

Controlled Waste Disposal

The environmental officers on the FET developed a plan that effectively balanced simplicity with effectiveness. First, the new disposal area needed to be as far away from the main part of the camp as possible to minimize exposure to smoke. Second, sound waste disposal needed to be easy. If it is too difficult and complex to comply with the requirements, then midnight dumping occurs, making the problem even worse. The basic concept became “one-stop shopping” for all disposal requirements—all forms of waste disposal located in one spot. This allowed a logical and controlled process that made it easy for units to comply. This facility, with easy access from the road, consisted of a recycling area, hazardous waste storage cells, a medical waste incinerator, and a large burn pit with controlled access.

Usable Materials

The first stop at the facility was the recycling area where units dropped off potentially usable materials, especially lumber and scrap metal. This provided numerous benefits to the camp—units could reuse these materials for building furniture, packing for shipping, fabricating parts, and repairing equipment. Lumber was scarce and expensive, and this was a great cost saving and a relief on resupply channels. And keeping the nonburnable material out of the burn pit greatly extended the life of the pit.

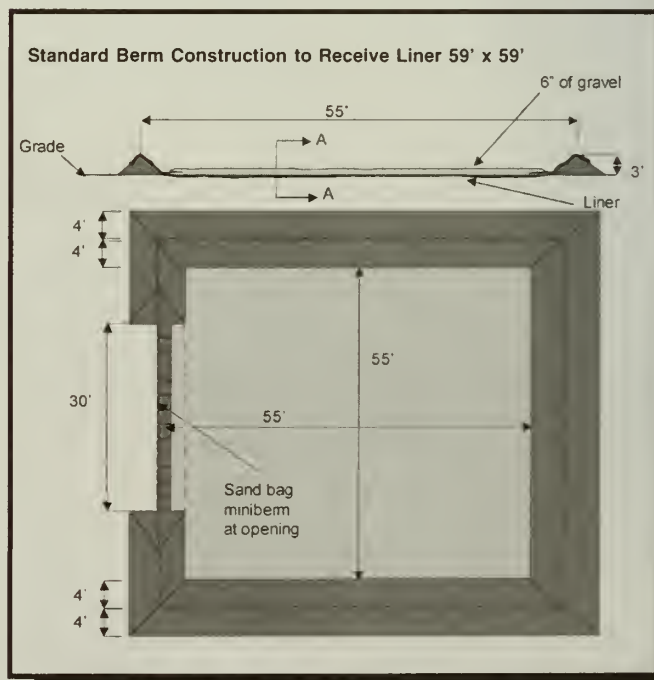
Hazardous Waste

The next stop was the hazardous waste holding area. This facility consisted of six bermed and lined cells, each 40 by 40 feet. Liners for the cells were unserviceable fuel bladders that

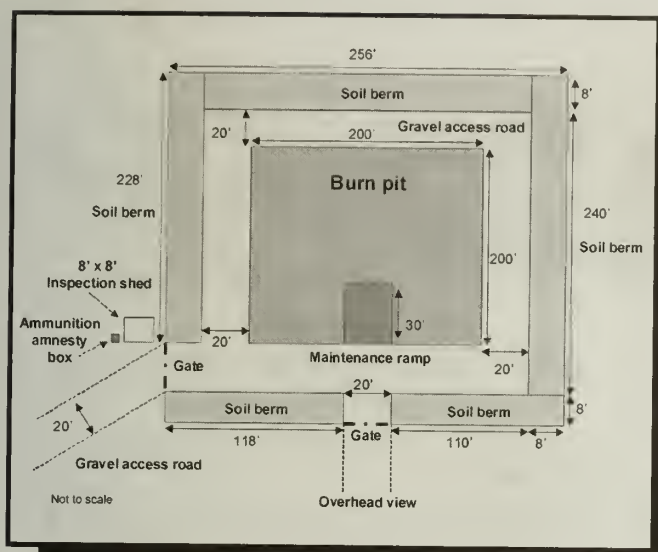


Soldiers dumping at the old burn pit were exposed to hazards of burning trash.

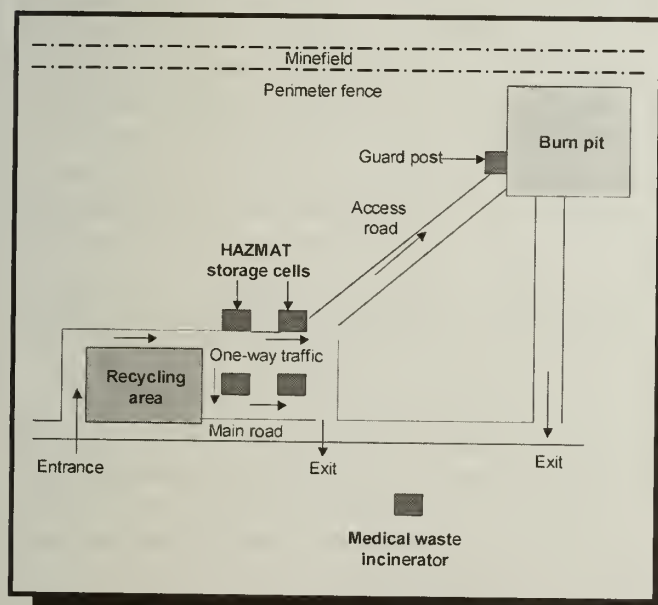
were drained, cut open, dried, laid flat, and covered with gravel. Soldiers then placed each type of waste (such as POL, batteries, and solvents) into separate designated cells, to comply with segregation requirements. Labeling standards were minimal to maintain simplicity and facilitate compliance with proper storage. Waste characterization, labeling, and preparation for shipment would be a task for the future base support contractor. Final disposal of hazardous waste would come later when a theaterwide disposal contract was in place. But until that time, the waste was effectively segregated, contained, and away from troop living and work areas.



Hazardous waste holding cell design



New burn pit design



Layout of the one-stop waste disposal area

Burn Pit

Once all reusable materials and hazardous waste were dropped off, the unit vehicle could then proceed to the burn pit. The FET incorporated several features into the design and construction of the pit. Most importantly, it was controlled. The pit was surrounded by a berm and barbed wire, and the single point of entry was gated and manned by a guard, who inspected loads to ensure that only appropriate waste was placed in the pit. The entry also featured an ammunition amnesty box, which kept hundreds of dangerous rounds from being placed in the fire. The burn pit (250 by 250 feet in area and 12 feet deep) was large enough to have a reasonable life span of 2 to 3 years. The large size allowed safe standoff between areas of the pit that were actively burning or smoldering and designated spots where units would dump

their loads, minimizing the likelihood of an injury from exploding debris. An entrance ramp allowed access by dozers and compactors to perform routine maintenance, also extending the life of the pit.

Medical Waste

Requirements for disposal of medical waste are more stringent than those for solid waste due to the potential bio-hazard of medical waste. Therefore, a small incinerator for medical waste was placed adjacent to the disposal area. The base support contractor was responsible for the operation and maintenance of the incinerator.

Conclusion

Tying the entire waste management program together required the vigilance of the unit chain of command and the base operations staff. As a result of the experience gained in its peacetime mission of environmental assessments at US Army Reserve Centers nationwide, the FET was able to provide expert environmental staff work. The FET also acted as the commander's eyes and ears to ensure that soldiers were complying with unit and Army environmental standards.

Sound environmental management in contingency operations is an important facet of force protection. It is necessary to minimize soldier exposure to potentially harmful contaminants and hazardous conditions at uncontrolled waste disposal areas and burn pits. To facilitate good waste disposal practices, the process needs to incorporate simplicity for the soldier and the unit, design and construction of facilities that provide access control and waste containment, and continuous enforcement by the chain of command. A properly designed and built one-stop waste disposal facility is a key component of a good environmental program that helps soldiers remain healthy and able to accomplish their critical mission outside the wire.



Lieutenant Colonel Anderson is the Commander, 733d Facility Engineer Detachment, Kansas City, Missouri. He was the team leader of FET 18, USAFEG, Kandahar, Afghanistan, and has served as S3 of 2d Brigade, 383d Training Support Battalion, as well as civil and mechanical engineer positions in the USAFEG. Lieutenant Colonel Anderson holds a bachelor's in civil engineering from the US Military Academy and a master's in environmental engineering from the University of Illinois.

Lieutenant Colonel Wolf is the team leader of FET 16, Omaha, Nebraska. He was the operations and environmental officer, FET 18, USAFEG, Kandahar, Afghanistan. He has held civil and mechanical engineer positions in USAFEG and was an operations research/systems analyst at Fort Leonard Wood, Missouri. Lieutenant Colonel Wolf holds a degree in civil engineering from Missouri Western State College.

Increased Battery Usage Raises Disposal Issues

By Mr. Mike Walker

Batteries are a critical component in many weapon systems and support equipment. Without power, the system is useless. The Army's current equipment power requirements have pushed battery usage to its highest level. Our forces have come within "days" of running out of batteries, and major combat operations could have ceased or been significantly changed without battery support.¹ By April 2003, production of the BA-5590 battery increased from 60,000 to nearly 125,000 per month. The companies went from two shifts a day for 5 days a week to operating 24 hours a day, 7 days a week just to keep up with the military's demand. It was estimated that of the combined four services, the actual battery usage was 180,000 batteries per month in Iraq. To fill the demand, the next generation of rechargeable, also referred to as "secondary" batteries, was introduced to the battlefield to supplement traditional nonrechargeable "primary" batteries. Rechargeable batteries were previously reserved for training use only because of charging constraints.

One battery type will not fit every component, nor are the procedures for disposal all the same. Because the responsibility of properly disposing of or recycling batteries can be confusing, the US Army Communications-Electronics Command (CECOM) created Technical Bulletin 43-0134, *Battery Disposition and Disposal*. Additional information, battery updates, and several battery Material Safety Data Sheets (MSDSs) are provided on the CECOM Web site at <http://www.monmouth.army.mil/cecom/safety/sservice/bs.htm>.

Some batteries are considered nonhazardous waste when fully discharged; others, due to their composition, are considered hazardous waste even if fully discharged. When batteries are improperly disposed of, they can contaminate water supplies, create fires, and explode—if mixed with solid wastes and burned. Protecting the soldier is the primary reason to understand battery disposal guidelines, because the adverse effects of improper disposal become force health protection and safety issues later.

Command emphasis, planning, providing awareness training, and following a few easy rules will ensure that all batteries are properly maintained, handled, and disposed of:

- Refer to the batteries' MSDSs for safe handling procedures, storage, and disposal information. All batteries should not be treated the same.

- Train personnel on which batteries can be recharged and which cannot.
- Train personnel on which batteries can be disposed of as nonhazardous waste and which have to be turned in for disposal as hazardous waste.
- Include information in the unit standing operating procedures (SOP) concerning the handling, storage, and disposal procedures for all batteries used by the unit.
- Always replace batteries in pairs; don't mix old with new or rechargeable with nonrechargeable batteries.
- Never dispose of any battery in a fire or into waste that is scheduled to be burned. (This would include most solid waste at a forward operating base.)
- Require trained personnel to handle batteries that have a complete discharge device (CDD). After the CDD is depressed, the batteries must sit for 5 days.
- Completely discharge batteries before disposal.
- Rotate battery stock: first-in, first-out (FIFO).
- Establish battery charging procedures in the unit SOP, if rechargeable batteries are used. Some batteries retain memory; if not completely discharged before recharging, they will lose charging life.

Properly maintaining batteries will ensure weapon systems and support equipment readiness. The increased use of rechargeable batteries will reduce the overall amount of used batteries generated. Providing awareness training and leadership emphasis on battery disposal procedures will ensure that batteries do not become a force health protection issue.



Mr. Walker is an environmental training specialist with the Directorate of Environmental Integration, US Army Engineer School, Fort Leonard Wood, Missouri.

Endnote

¹ Geoff S. Fein, "Battery Supplies Ran Dangerously Low in Iraq," *National Defense*, September 2003, pp. 16-19.

Army Engineers Help Restore Iraqi Wetlands

By Ms. Nani Gould

The Mesopotamian Marshlands, considered by many to be the cradle of civilization, were largely drained by Saddam Hussein's regime. Now, the US Army Corps of Engineers (USACE) is helping restore the historic wetlands. Located between the Tigris and Euphrates Rivers, the marshes were once among the world's largest wetlands. Within this 8,000-square-mile area, the 5,000-year-old culture of the Madan, or Marsh Arabs, developed the first alphabet.

Before their destruction, the Mesopotamian Marshlands spanned an area roughly twice the size of the Florida Everglades. Known for their biodiversity and cultural richness, the marshes were home to millions of birds, fish spawning and nursery areas, and various agricultural crops. The devastation seen under the hand of the former regime has been compared to the deforestation of the Amazon.

After putting down a rebellion by the Marsh Arabs at the end of the Gulf War, the Iraqi government set its full wrath upon the group—burning towns, killing livestock, and making the drainage of the marshlands a top priority. An estimated 150,000 people were displaced during this time; some were forced to relocate as many as 18 times.

By 1999, the marshlands had been reduced to 7 percent of their original state. Many endemic species were lost, a natural filter system for protecting rivers and the Persian Gulf from waste and pollutants was devastated, and an entire culture rich in history was destroyed. The area was in dire need of structure and rebuilding efforts.

The US Agency for International Development (USAID), an independent federal government agency that funds development projects in many countries, is leading the effort to restore these marshlands. USAID, the Iraqi Ministry of Water Resources (MoWR), and USACE are developing a water management model that will aid efforts to reconstruct Iraq's historic water flow system and restore Iraq's marshes.

To help the remaining marshland population and support other US efforts to secure Iraq's infrastructure, USAID turned to the Corps's Hydrologic Engineering Center (HEC) for its expertise in modeling water management in large watershed systems. The HEC is responding by developing a reservoir-

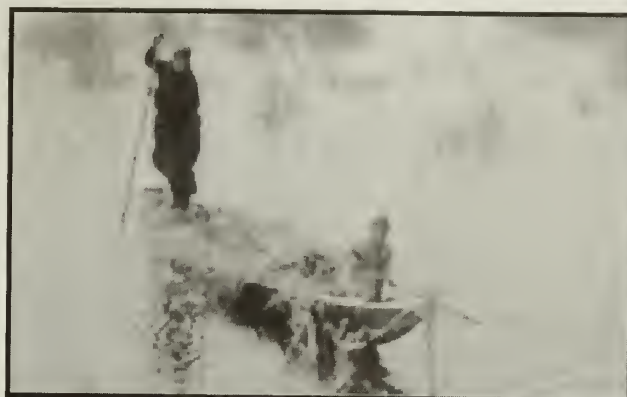


Photo courtesy USAID

simulation model (See article on page 10.) This model will provide real-time simulation to help US officials and the new Iraqi leadership make smart operational decisions to maintain and update the country's complex system of dams and canals.

After the invasion, Iraq's dam and infrastructure system was intact, but the institution was in disarray. The MoWR headquarters building had been burned, and its ability to manage the complex system of dams and barrages was significantly compromised. The HEC Reservoir System Simulation (HEC-ResSim) model will provide modern technology for use in both day-to-day operational decisions and long-term water resource management studies.

The HEC-ResSim model is being developed in two phases. Phase 1, which established a relationship between the HEC and other Iraqi groups working with the marshlands, also successfully developed the concept of the water control system. Phase 1 was completed in November 2003. Phase 2 develops the model in more detail and extends the lower boundary to marsh areas. It also adds structure and develops data sets useful in long-range planning and studies of alternative operations.

The HEC-ResSim model will provide the MoWR with the capability to make detailed assessments of the consequence of alternative reservoir releases prior to issuing operation instructions to dam operators. Also, other Iraqi agencies, such as the Ministry of Environment, and nongovernmental agencies interested in marsh restoration, such as the US-based Iraq Foundation, will be able to use the model in support of their studies and activities. The partnership between USAID, MoWR, and USACE is designed to eventually restore the Mesopotamian Marshland ecosystem through improved management of the nation's water infrastructures and natural resources.



Ms. Gould works in the Public Affairs Office at the Army Environmental Center, Aberdeen Proving Ground, Maryland.

Note: A variation of this article was printed in the Army News Service, Washington, on 4 August 2004.

ARMY ENGINEERS DEVELOP MODEL TO SUPPORT IRAQI WATER MANAGEMENT

By Ms. Nani Gould and Mr. Fauwaz Hanbali

A country torn apart by decades of cultural and political violence, postwar Iraq is working to rebuild its towns and restore its economy. Thousands of displaced Iraqis are now seizing the opportunity to return to their homes and their indigenous way of life. This is the case for the Madan, or Marsh Arabs, who have resided in the delta region of Iraq for 5,000 years and were targeted by the former regime after the first Gulf War for giving sanctuary to rebels. The Madan relied heavily on the marshes to sustain their way of life until 1991, when the Ba'athist regime began to drain the marshes, destroy towns, and force the Madan to flee their homes. The Tigris and Euphrates River system was diverted from its normal path through 8,000 square miles of marshes to a direct route into the sea, ultimately turning the thriving marshlands into a desert. Today, there is much interest in evaluating the existing water management system in Iraq and the possibilities it can provide for restoration of these marshes.

For a nation that relies on other countries for most of its water supply, Iraq is urgently working to restore its own water system infrastructure. Under the old regime, technology used to manage dams and canals fell short of systems used in much of the industrialized world. The Ministry of Water Resources

(MoWR), formerly the Ministry of Irrigation, is beginning to modernize the water system with the latest technology and state-of-the-art software for support of its water management mission. It is undergoing substantial rehabilitation after suffering considerable postwar losses, especially technical references and computer resources, due to fire damage and looting.

Reservoir Simulation Model

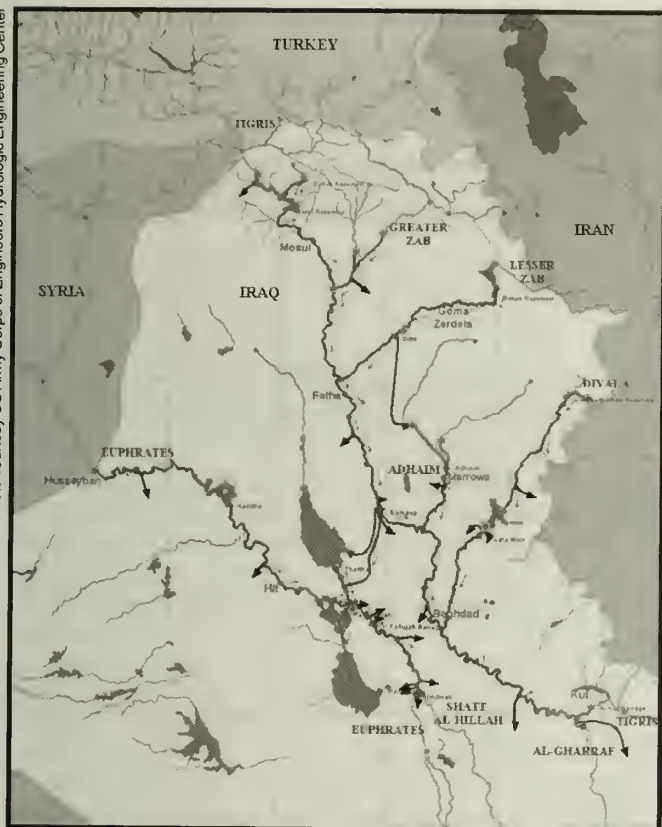
To assist in this effort, the US Army Corps of Engineers (USACE) and the US Agency for International Development (USAID), an independent federal government agency that funds development projects in many countries, have partnered to help restore the Iraq marshland ecosystem through improved management of the nation's water infrastructure and natural resources. Heading up this effort to revive Iraq's water system infrastructure is the USACE Hydrologic Engineering Center (HEC), in collaboration with Development Alternatives, Incorporated, the USAID agent. HEC is developing a reservoir simulation model for the Tigris and Euphrates River system in Iraq. This model will provide a means for performing water resources planning studies, as well as decision support for Iraqi officials managing the real-time operation of the country's intricate system of dams and canals.

From the outset, it was recognized that Iraq's geographical setting and environmental factors posed challenging situations for hydrologists to consider for this project, including uneven distribution of precipitation and a natural topography that is not conducive to drainage. The water management model would need to account for all of the water coming into Iraq, including its storage, release, and movement. It would also be used to simulate historical events—in particular, extreme flood and drought periods. The end result is the HEC's Reservoir System Simulation (HEC-ResSim), a decision support tool that uses state-of-the-art software to aid the MoWR in its operation of the complex water management system in Iraq.

Photo courtesy US Army Corps of Engineers



A traditional Marsh Arab hut in southern Iraq, where the Ministry of Water Resources—with help from American agencies—is restoring the Mesopotamian marshes.



A preliminary HEC-ResSim schematic shows a network of dams and reservoirs throughout the system.

Iraq's marshlands have complex flow patterns and require specialized models to analyze the flow circulation through the marshes. At the same time, there is a great interest by those devoted to marsh restoration to be able to use the output from the HEC-ResSim water management model to determine critical matters such as whether there is enough water available to restore the marshes to their historic levels. In developing the model, HEC employed a two-phased approach that initially produced a preliminary water balance model that covers the Tigris and Euphrates Rivers, as well as their tributaries in Iraq.

Phase I

Completed in November 2003, Phase I successfully developed the concept of the water control system, established a relationship between HEC and Iraqi engineers, and implemented operational rules and criteria. Specifically, HEC researched public sources and accumulated essential publications, reports, and data relating to the hydrology of the Tigris and Euphrates watersheds. HEC also hosted two Iraqi engineers from the MoWR to complete the preliminary reservoir model. The partnership between HEC and the Iraqi engineers proved to be a vital component

in developing an accurate water simulation model. Their hands-on experience and familiarity with Iraq's topography, as well as years of data carefully recorded in notebooks, provided the criteria for the HEC-ResSim model. Additionally, a comprehensive review of the watershed layout was conducted, the reservoir network connectivity was verified, and historical stream flow records dating back to 1930 were digitally archived into the HEC data storage system.

The HEC-ResSim software was used to construct a geographically referenced model of the reservoir system in Iraq. The model consists of six major reservoirs, three massive off-stream storage reservoirs, seven chief barrages, and many diversions to reflect water withdrawals along different reaches of the Tigris, its tributaries, and the Euphrates. The primary reservoirs include the Mosul Reservoir downstream of the Turkish-Syrian border on the Tigris and the Haditha Reservoir on the Euphrates. Basic model input incorporates reservoir storage capacity curves, individual outlet capacities, power plant characteristics, river reach flow routing parameters, water demand diversion requirements, reservoir seasonal target levels, and rules of operation. The primary objectives of the reservoirs in the model are to generate hydropower, mitigate flooding, and supply water for irrigation, because approximately 85 percent of Iraq's water supply is used for irrigation purposes.

Reservoirs are key to the capture and storage of floodwaters to meet the country's irrigation requirements and ensure that Iraq's primary crops—including wheat, barley, and rice—are farmed successfully. In addition, the recent return of date palm orchards has brought back an important part of the economy in southern Iraq. Vegetative covers such as reeds are harvested commercially for building materials, and water

(Continued on page 15)

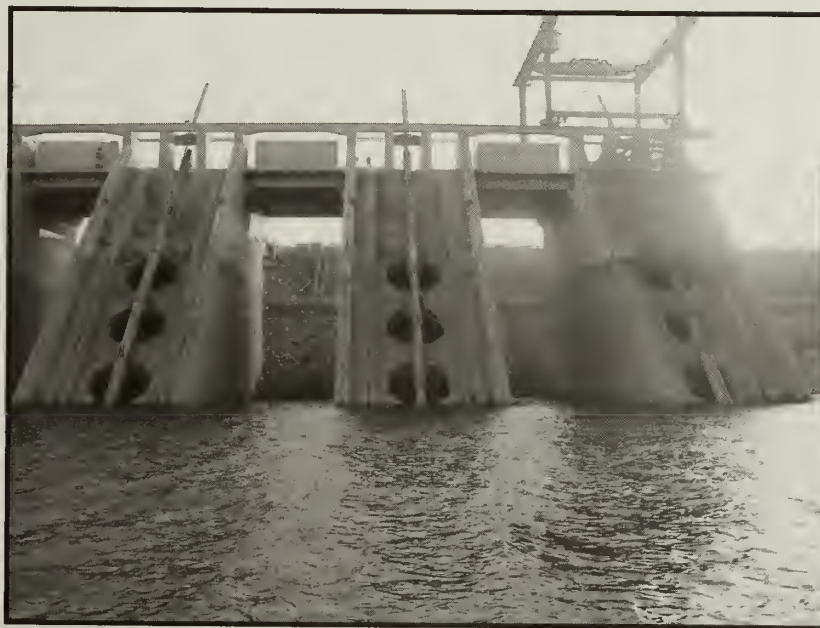


Photo courtesy US Army Corps of Engineers

Upcoming USACE projects include rehabilitation of water control structures such as these gates at Mosul Dam.

COMPATIBLE USE BUFFERS— A NEW WEAPON TO BATTLE ENCROACHMENT

"Providing ranges and training lands that enable the Army to train and develop its full capabilities is crucial to ensure that America's forces are relevant and ready now."

—Major General Larry J. Lust
Assistant Chief of Staff for Installation Management

By Lieutenant Colonel Joseph L. Knott and Ms. Nancy Natoli

The foundation of Army operational readiness is highly trained soldiers. To conduct tough, realistic training, commanders require continued access to critical ranges and training lands. Encroachment from population growth, urban development, and environmental requirements limits the Army's ability to fully utilize our installations for realistic combat training. Congress recently acknowledged the threat of encroachment to military readiness and provided a legislative tool that allows the Army to work with other government or private partners to establish buffer areas around active ranges and training lands.

Training Realism

Our nation is in the midst of a global war on terrorism. Every soldier and commander knows the importance of training—particularly realistic training—to our ultimate success. In a recent ambush in Iraq, a unit came under attack from grenades, improvised explosive devices (IEDs), mortars, and small arms in downtown Baghdad when crossing under an overpass. "It's a surreal feeling; everything is [slow-motion]. You really don't think; you just react like you've been trained to during a contact," a Stryker vehicle gunner said.

As the soldier in Iraq alluded, *we must train as we fight*. The advent of future combat systems with more lethality and increased range will require even larger physical maneuver areas to ensure realism. For example, as shown in the table below, a World War II brigade doctrinal footprint required fewer than 100 square kilometers (sq km). The current Heavy Brigade

Combat Team and Stryker Brigade Combat Team requirements are an order of magnitude larger, while the Future Force requirement will be as much as two orders of magnitude larger—an area greater than the states of Rhode Island and Delaware combined.¹

Simulations can and do play a key role in training, but when it comes to achieving the level of proficiency that is so critical to ensuring combat readiness, we know there is no substitute for live-fire and maneuver training. As an Army at war, it is more important than ever that we provide tactical commanders unfettered access to ranges and training areas to maintain combat readiness. However, there are several trends that are challenging the Army's ability to train and maintain weapons proficiency. These trends are collectively termed *encroachment*.

Encroachment

Generally, encroachment is an infringement on another's rights or property. For the Department of Defense, encroachment is the cumulative result of any and all outside influences that inhibit normal military training and testing. We see encroachment at military installations in previously isolated and rural areas that are now surrounded by urban development and above-average population growth, such as Fort Bragg, North Carolina (see Figure 1, page 13). These land uses are not compatible with military live-fire training and testing exercises, and they begin to inhibit and intrude on the Army's ability to train and test our warfighting capabilities.

Brigade Doctrinal Footprint Requirements	
Brigade Type	Doctrinal Battlefield Footprint
World War II Brigade	8 x 12 kilometers (96 sq km)
Heavy Brigade Combat Team	20 x 30 kilometers (600 sq km)
Stryker Brigade Combat Team (2003)	40 x 40 kilometers (1,600 sq km)
Future Force	75-kilometer radius (17,671 sq km)

Increased environmental regulation also restricts training. Regulations designed to protect air and water quality, manage noise, and protect cultural resources also restrict the timing and frequency of training, reduce the space available for maneuvers and tactical use, and limit the number of live-fire exercises.

Habitat management responsibilities for endangered species represent another component of encroachment that threatens the Army's ability to fully use our land assets. This trend is related to suburban sprawl, which has reduced the size of wildlife habitats on private lands. When Major General R.L. Van Antwerp was Assistant Chief of Staff for Installation Management (ACSIM), he asserted that many of the Army's training ranges are actually "islands of biodiversity," on which wildlife take refuge from the expanding human presence and corresponding habitat destruction. Federal regulations require the Army to protect an increasing list of endangered plants and animals living among those islands, which limits the use of many training and testing ranges. Nearly 100 Army installations are home to more than 150 federally listed and protected species, creating a disproportionate burden for critical habitat management to support species recovery.

While nearly half of Army installations suffer training restrictions because of encroachment, readiness has not suffered, due to the creativity and flexibility of our commanders and noncommissioned officers. When obstacles threaten training, units find a workaround to accomplish the mission. Unfortunately, these workarounds reduce realism, increase costs, and shorten usable equipment life. James Gunlicks, Deputy Director of Training, Deputy Chief of Staff G3, at Headquarters, Department of the Army (HQDA), describes the cumulative effect of workarounds as "death by a thousand paper cuts."

To address these issues, HQDA is pursuing sustainable approaches to buffering ranges and installations from surrounding growth and balancing environmental mandates with readiness imperatives. The Army has established a Sustainable Range Program to maximize the capability, availability, and accessibility of ranges and training land by minimizing restrictions from external factors. An important component of this program is working with local communities and nongovernmental organizations to improve land-use planning. Congress has also supported this effort with recent legislative authority, allowing the Army to formalize this process through establishing compatible use buffers around military installations.

Army Compatible Use Buffer Program

The compatible use buffer concept began in the 1990s at Fort Bragg, in the Sandhills region of North Carolina. This area is dominated by a pine ecosystem that is home to the red-cockaded woodpecker, an endangered species. After significant training restrictions were imposed in the early 1990s, Fort Bragg, the US Fish and Wildlife Service, the state, and other regional partners began to look for solutions to halt the decline of red-cockaded woodpecker habitat. In 1995, the

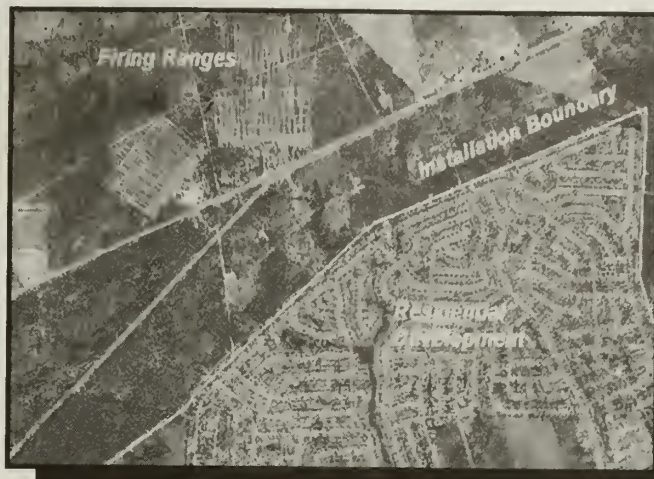


Figure 1. Fort Bragg, North Carolina

Army entered into a cooperative agreement with The Nature Conservancy to identify and acquire private land or development rights from willing sellers for the purpose of conservation. In 2003, Congress provided explicit legislative authority to expand the Private Land Initiative to other installations.

Legal Authority

Title 10, United States Code, Section 2684a, "Agreements to Limit Encroachments and Other Constraints on Military Training, Testing, and Operations," was enacted by Congress as Section 2811 of the National Defense Authorization Act for fiscal year 2003. This authority represents a powerful tool and unique opportunity for the Department of Defense to work in partnership with states, other governments, and public or private environmental and conservation groups to achieve a common goal of sustainability. By addressing incompatible land use and unconstrained development, it contributes to managing suburban sprawl and wise growth management. It also provides authority for the Army Compatible Use Buffer (ACUB) Program.

Program Description

The ACUB Program, which was implemented by guidance in a 19 May 2003 memorandum from the HQDA Deputy Chief of Staff G3 Director of Training, and ACSIM, entitled "Army Range and Training Land Acquisitions and Army Compatible Use Buffers," represents a new and innovative tool to address encroachment at Army installations. ACUBs allow the Army to work with partners to encumber land to protect habitat and training without using the lengthy and complicated land acquisition process administered under Army Regulation 405-10, *Acquisition of Real Property and Interests Therein*.

ACUB Process

All installations can evaluate ACUBs as a possible tool to mitigate encroachment effects on the training mission. ACSIM is the proponent for ACUBs and has final approval authority; however, Active Army installations

“Encroachment issues can impact the ability to exercise soldiers, leaders, units, and equipment in a real-world environment, prior to deployment to a war zone.”

Cooperating partners and willing sellers are essential to successful execution of ACUBs. During the process, the installation (assisted by ODEP, the US Army Environmental Center (USAEC), and the IMA/MACOM) negotiates with the cooperating partner to formalize the details of a Scope of Work (SOW) contingent on ACSIM approval of the ACUB. The SOW outlines the Army's and the partner's areas of mutual interests, responsibilities, timeframes, financial contributions, and other dependencies. It can be conceptually discussed early in the process, but formalized only after HQDA approval of the ACUB proposal. After the partnership details are authorized in the SOW, a cooperative agreement is the formal procurement document for executing the SOW and must be executed by an authorized grants officer.

ACUB Priorities

- Fort Carson, Colorado
- Fort Benning, Georgia
- US Army Garrison, Hawaii
- Fort Hood, Texas
- Fort Stewart, Georgia
- Fort Richardson, Alaska
- Fort Bragg, North Carolina
- Fort Sill, Oklahoma
- Fort A.P. Hill, Virginia
- Fort Campbell, Kentucky
- Camp Ripley, Minnesota
- Camp Shelby, Mississippi

ACUB Successes

ACUB partnerships are also underway at major power projection installations such as Fort Carson, Colorado, and

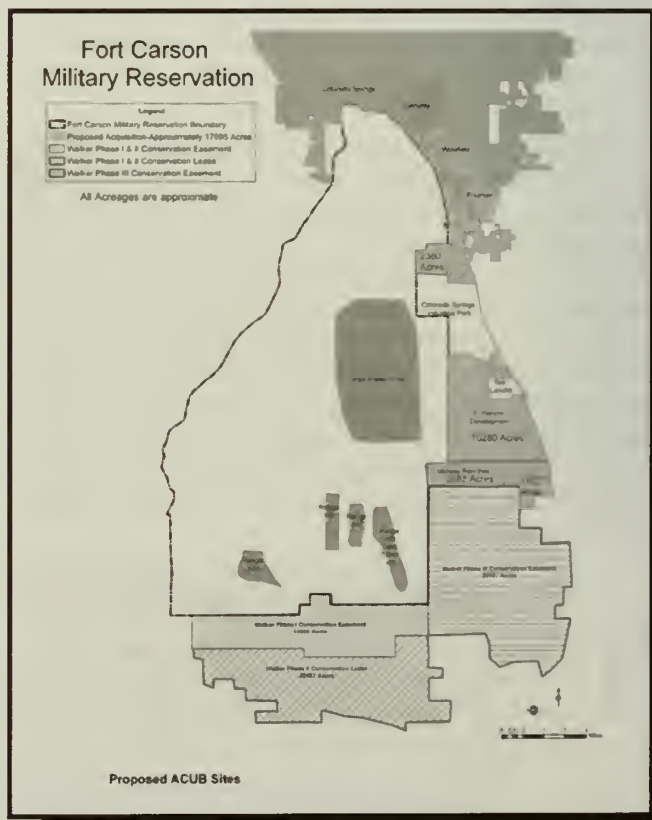


Figure 2. Fort Carson Military Reservation

the US Army Garrison, Hawaii. Fort Carson has an approved ACUB proposal to purchase a 14,000-acre parcel to buffer 14 miles of its southern border (see Figure 2). Activities at three Fort Carson firing ranges could be substantially curtailed if this property were developed. The installation and partner have been working with a private owner with large land holdings to prevent further threats to installation activities from encroachment.

The US Army Garrison, Hawaii, is an essential power projection platform with minimal deployment time for the Pacific theater. The Garrison has negotiated a draft agreement to cooperate in purchasing a 1,100-acre parcel that may soon be developed. Purchasing this property, with the Hawaii state parks holding title and land management responsibility, will allow land to be dedicated to increasing the endangered plant population outside the fence and meet the requirements of a US Fish and Wildlife Service "no jeopardy" opinion. The Army's \$3 million contribution to the total \$12 million purchase will also relieve some residential land development pressure in the area.

Summary

ACUBs represent an innovative and effective tool for mitigating the effects of encroachment on Army training and testing. They provide a mechanism for an installation to share natural resource conservation responsibilities with our neighbors, positively influence land use outside of the installation, and ensure that the installation's land resources are used most effectively to provide the realistic training and testing that American soldiers require to remain victorious in battle and persuasive in peace.

The HQDAACUB program manager is Lieutenant Colonel Joseph L. Knott, (703) 601-1596; e-mail <joseph.knott@hqda.army.mil>. The US Army Environmental Center ACUB point of contact is Scott Belfit, (410) 436-1556; e-mail <scott.belfit@us.army.mil>.

Lieutenant Colonel Knott is the HQDA Training Lands Support Officer in the Office of the Director of Environmental Programs under the Assistant Chief of Staff for Installation Management. His previous assignments include commander of the 216th Engineer Battalion (Combat Heavy), project coordinator for the Massachusetts Military Reservation Groundwater Cleanup Program, and operational and command positions in Southwest Asia and Central America.

Ms. Natoli is a Research Fellow at LMI with prior experience at the Army Environmental Policy Institute and the US Army Construction Engineering Research Laboratory. She holds two degrees from the Massachusetts Institute of Technology.

Endnote

¹As Future Force platforms are developed, fielded, and exercised, the doctrinal footprints will be refined.

(Continued from page 11)

buffalo, a traditional livestock of the Iraqi people, have also returned to the marshes. The water supply will be critical to ensuring that all these components of the restored ecosystem thrive and grow.

Phase II

This phase began in January 2004 and should be completed by the end of the year. HEC will continue to reestablish and modernize water management in Iraq and coordinate with the MoWR and interested parties. Primary objectives include an on-site assessment of existing stream gage network and upgrade needs, as well as refinement of the reservoir model to analyze existing and projected water shortages in the system.

A training course is planned for the HEC-ResSim model in Baghdad, upon completion of Phase II. The goal is for two HEC staff members to travel to Baghdad and present one week of training for up to 30 MoWR engineers. Training will focus on use of the software and model for real-time decision support and planning studies. Currently, however, technology transfer between the HEC—located in Davis, California, and the MoWR headquartered in Baghdad—has proven to be challenging.

Far-Reaching Impacts

The HEC-ResSim model has drawn attention from around the world. USACE personnel stationed in Afghanistan have shown interest in the model for similar work they are doing in that country. This model is expected to have far-reaching impacts, and hopefully it will be used in other countries that need help studying and solving reservoir system management problems. HEC and the Afghanistan Engineer District recently teamed up to develop a reservoir simulation model of Kajakai Reservoir and other projects in nearby valleys. The model will simulate system operations for hydropower, flood control, and irrigation, reflecting substantial planned upgrades to the reservoir's generating capacity, live storage, and discharge facilities. USACE is continuing to evaluate the software for additional projects and future partners.

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Mr. Hanbali is a hydraulic engineer for the USACE HEC Water Management Systems Division. He is involved in the development and application of the USACE Water Management Systems and HEC-ResSim software. Mr. Hanbali holds a bachelor's in civil engineering from the University of Maryland and a master's in river engineering from IHE Delft, the Netherlands.



By Ms. Nancy Allen and Mr. Christopher Augsburger

The US Army Corps of Engineers (USACE), usually known for designing and constructing water control structures, has taken on a very different engineering challenge—bringing down a 150-year-old dam.

On 23 February 2004, the Norfolk District of USACE began this historic mission. Six hundred pounds of explosives set by the Army and Air Force Reserves blasted a 130-foot section in the middle of Embrey Dam in Fredericksburg, Virginia, allowing the Rappahannock River to flow freely for the first time in more than 150 years. The detonation opened approximately ten 10-foot holes in the structure, allowing fish to pass through as part of their natural migration cycle.

The Rappahannock River flows 184 miles from a spring in the Blue Ridge Mountains to the waters of the Chesapeake Bay. Fredericksburg, a historic Virginia town founded in 1728, sits at the fall line of the Rappahannock. A wooden crib dam was the first dam built on the falls in 1853. In 1910, the Fredericksburg Water Power Company finished construction on a 770-foot-long,

22-foot-high concrete dam that spanned the Rappahannock River. The Embrey Dam was an Ambursen-type dam, consisting of a series of reinforced concrete buttresses (14 feet on center) with sloped (38 degree) concrete slabs on the upriver side. It was used to generate hydroelectric power until the 1960s. The city of Fredericksburg also used water diverted by the dam into the Rappahannock Canal as a raw water source for the city's supply until early 2000.

In 1985, a group of Fredericksburg business owners, politicians, and community members formed Friends of the Rappahannock (FOR), which focused on keeping the river healthy—among other missions. One of their primary concerns regarding the health of the river was the decline of migratory fish stocks, such as American shad, hickory shad, blueback herring, and striped bass that were once so plentiful in the Chesapeake Bay watershed. These anadromous species spend most of their lives at sea and only enter freshwater rivers, such as the Rappahannock, to spawn.

Together with the Virginia Department of Game and Inland Fisheries, FOR began to raise awareness of the migratory fish passage problem. Fish elevators and other solutions were not feasible at Embrey, and the groups advocated complete removal of the dam.

There were other factors supporting the removal of the dam, the greatest of which was that it had fallen into disrepair and would cost the city millions to rehabilitate. Another factor was safety, since the citizens of Fredericksburg frequently played in and around the dam. In addition, canoeists and kayakers traveling on the river were forced to portage around the dam.

By the mid-1990s, the city of Fredericksburg began working with neighboring Spotsylvania County to develop new regional water supply solutions. These discussions made it clear that the water plant connected to the Embrey Dam could be closed, thus eliminating the last major “need” for the dam.

One of the major obstacles to removing the dam was the cost and

funding sources. As early as 1992, city officials met with USACE to discuss the feasibility of removing the dam using federal funds. Then the push to remove Embrey Dam received a major boost in May 1996 when FOR invited Virginia Senator John Warner for a roundtable discussion about the project. The Senator pledged that if the group could demonstrate that there was community consensus to take down the dam, he would take it on as a personal project.

The senator arranged for \$100,000 for the Corps to conduct a reconnaissance study. Engineers, biologists, oceanographers, planners, economists, archaeologists, social scientists, and other subject matter experts from the Corps's Norfolk District collected and analyzed a vast amount of data. In the end, the study had to weigh the project benefits against any potential adverse project impacts and ultimately determine if any aspect of the Embrey Dam removal would result in significant, long-term adverse impacts on environmental resources.

In 1998, the Corps concluded that fish passage and the restoration of the Rappahannock River was in the public interest, making the project eligible for federal funding. The preferred alternative called for building a sediment containment area, dredging behind the structure, and completely removing Embrey Dam. It would restore more than 100 miles of main stem fish spawning and rearing habitat, open up the longest flowing river in the Chesapeake Bay drainage, enhance the Rappahannock for anglers and recreational users, and save the city of Fredericksburg millions. A year later, the Water Resources Development Act authorized \$10 million for the project.

In March 2003, after the necessary permits had been obtained, the Norfolk District hired a contractor to oversee the removal of 250,000 cubic yards of sediment. This was to minimize any possible impact from increased sediment levels downstream during the breaching. The project plan called for a section of the dam to be breached using explosives in February 2004. Timing was critical



Photo courtesy Davis Turner, The Free Lance-Star

The removal of Embrey Dam was dubbed Operation Noah Shiva.

because the dam had to be breached in time for fish to take advantage of the newly reopened fish passage during the spring migration season.

The Corps began working with the US Army Dive Company and the US Air Force 555th RED HORSE Reserve Squadron on the demolition under the Department of Defense's Innovative Readiness Training (IRT) program. The IRT program was developed to find ways to use the military's unique resources and capabilities to serve American communities in need while providing realistic military training benefits. The team developed a plan to blast about 10 of the buttresses, or about 130 feet of the dam. Divers worked in 35-degree water, drilling hundreds of holes into which some 650 pounds of explosives would be placed. The operation was named "Noah Shiva" after the biblical account of Noah and the great flood and the Hindu god for destruction and rebirth.

Although only ten percent of the charges ignited the first time, a second blast occurred shortly afterwards, and the Rappahannock was flowing freely for the first time since 1853. The river rose quickly, but no downstream flooding occurred—as predicted by the Corps's hydrological models—and then the river dropped back to its normal levels.

The remaining sections of the dam will be removed by mechanical means.

The project is scheduled for completion in 2006. Embrey Dam will be the largest dam removed in the United States since 1999, when the Edwards Dam was removed from the Kennebec River in Maine.

This project was unique because of all the different partners it brought together, including not only city, state, and federal agencies but also military and environmental representatives at every level. By reopening more than 1,300 river miles to migratory fish in the Chesapeake Bay watershed, we are allowing American shad and blueback herring to reclaim their native waters as part of our concerted effort to restore the life of the Bay.



Ms. Allen is a public affairs specialist with the USACE Norfolk District. Before joining the Corps, she worked for the Hampton Roads Chamber of Commerce and the Hampton Roads Maritime Association. She holds a bachelor's in mass communications from Virginia Wesleyan College.

Mr. Augsburger spent five years as a member of print and broadcast media before joining the USACE Baltimore District as a public affairs specialist. He holds a bachelor's in mass communications from Towson University.

Clean Marinas Promoted in Cumberland River Basin

By Mr. David S. Treadway

The Nashville District, US Army Corps of Engineers (USACE), is implementing a Clean Marina Program (CMP) for the Cumberland River Basin and becomes one of the first USACE districts in the nation to sponsor such a program. The program allows marina operators to certify that they are environmentally conscious and are attempting to go above and beyond what is required by law and regulations and within their lease requirements.

Then Major General (P) Carl A. Strock, now Chief of Engineers, endorsed the program in a May letter to division and district commanders while he was Director of Civil Works: "Building on the solid foundation of our Environmental Operating Principles and in implementation of our Civil Works Strategic Plan, the Corps of Engineers strongly endorses the Clean Marina Program and encourages all districts to share information on the program with their lessees and recreation partners."

Originally developed in coastal states to address nonpoint source pollution under the Coastal Zone Act Reauthorization Amendments of 1990, CMPs have been adopted or are being developed by 18 states, the District of

Columbia, and several federal agencies. With 456 lakes around the United States, USACE (with agency partners) is the largest provider of marinas east of the Mississippi River.

The program is designed to help marina operators protect the very resource that provides them with their livelihood. It also encourages boater education, increased coordination among state agencies, and better communication of existing laws.

Two Cumberland River Basin Marinas—Willow Grove Marina at Dale Hollow and Green Turtle Bay Marina at Lake Barkley—will serve as models for the certification process. Other marinas at Old Hickory Lake and J. Percy Priest Lake have expressed interest in the

program. Officials opened the program to all interested marina operators during the Kentucky and Tennessee Marinas Association meeting in November.

The Nashville District's program is a model of cooperation. Many partnering agencies worked closely to draft the guidebook and certification checklist. The Tennessee Department of Environment and Conservation, Division of Water Pollution Control, and the Cumberland River Compact reviewed the guidebook and checklist, providing valuable suggestions for improvement. The Tennessee Wildlife Resources Agency reviewed the program and gave permission to use the agency's logo in the package.

Marina operators must take a number of steps to attain certification. They first sign a pledge and commit to controlling pollution and erosion at their facility and to promoting water protective behavior with the boating public. Next, they familiarize themselves with the program guidebook and accompanying checklist. With that checklist, they conduct a self-assessment and invite the lake resource manager to visit and endorse the marina for the program. The checklist covers a wide variety of related questions in seven critical areas: sewage management; oil and gas control; solid waste and petroleum recycling/disposal; vessel maintenance and repair; marina siting, design, and maintenance; storm water management and erosion control; and public education and water safety.

CMPs are entirely voluntary. Certification means that marinas can display a certificate and Cumberland River Basin Clean Marina flag, indicating their new status. Recognition in press releases and promotions can then follow. If desired, recertification is completed every five years. If a marina changes hands, the new owners can go through the process to be certified as a clean marina. 

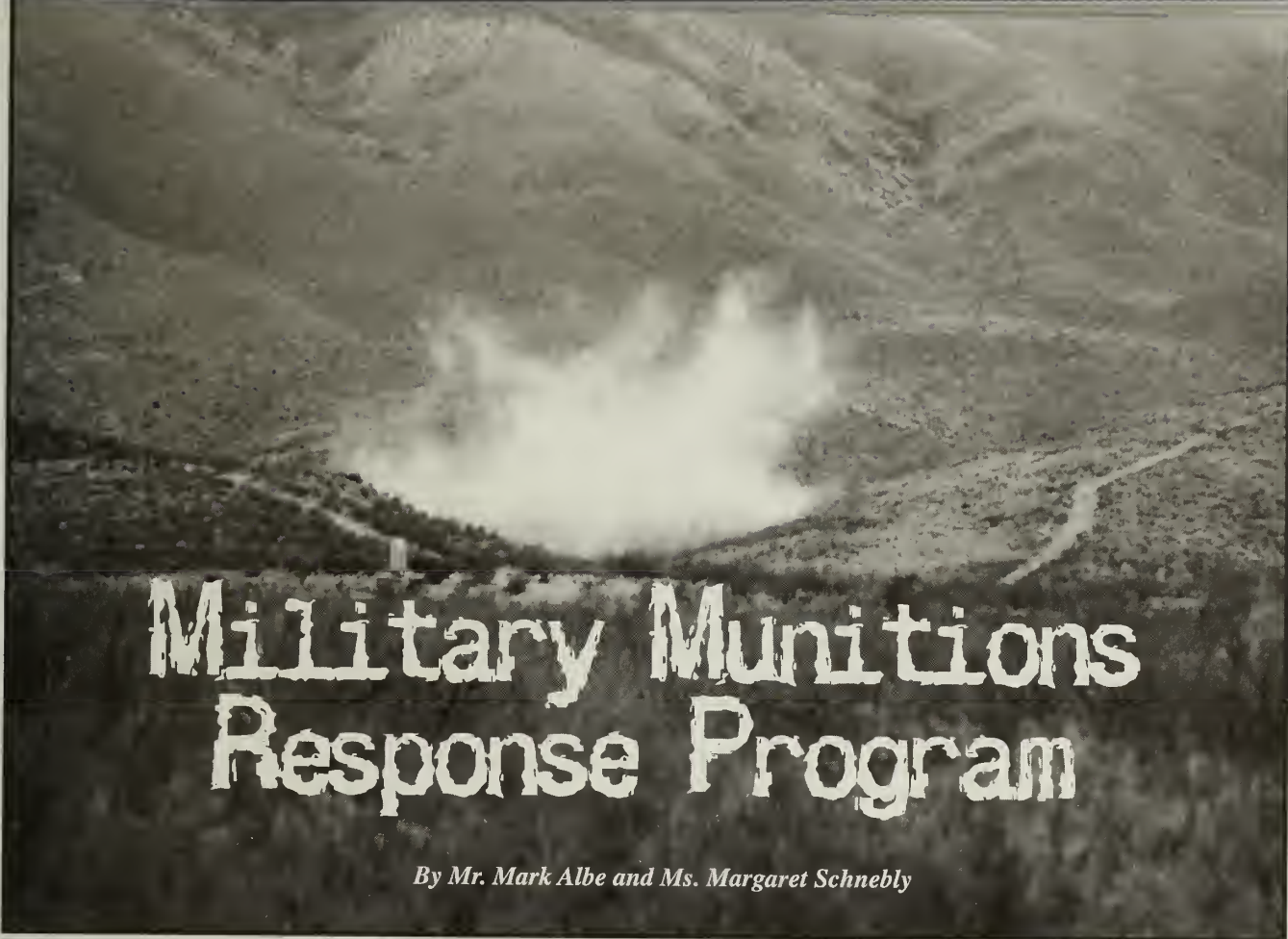
Mr. Treadway is a public affairs specialist with the Nashville District, USACE. He is retired from the US Marine Corps. He was General H. Norman Schwartzkopf's Public Affairs Chief during the Gulf War in 1990.



Photo by David S. Treadway



High School students work at Conley Bottom Marina on Lake Cumberland to help rid the lake of garbage.



Military Munitions Response Program

By Mr. Mark Albe and Ms. Margaret Schnebly

Photo courtesy Fort Bliss, Texas

The Installation Restoration Program (IRP) has been the Army's primary cleanup program within the Defense Environmental Restoration Program (DERP) since the 1980s. Historically, IRP focused on cleaning up sites contaminated with hazardous substances that posed toxicological risks. This changed in 2001 with the establishment of a new Army cleanup program that targeted military munitions.

The Military Munitions Response Program (MMRP) was formalized in September 2001 when the Department of Defense (DOD) published new management guidance for DERP. A new program category under DERP, MMRP addresses environmental health and safety hazards associated with unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents on current and former military sites as a complement to the highly successful IRP.

In December 2003, the Army fulfilled its first MMRP requirement—an inventory of its former training ranges and munitions sites to identify sites eligible for MMRP. In fulfilling its obligations under MMRP, the Army's first priority is the protection of human health, safety, and the environment. The Army went beyond the letter of the requirement and expanded its data gathering efforts to account for additional pertinent information. As a result, the Army not only expedited the program's decision-making process—with human health and safety the top priority—but also put itself ahead of schedule and established a precedent for MMRP success.

Legislative Background

This MMRP inventory effort, part of a larger mission to ensure public health and environmental safety, has been underway since fiscal year (FY) 2002, when Congress passed the National Defense Authorization Act. This piece of legislation set MMRP in motion by requiring the military services to complete the following:

- Develop an initial inventory of all current and former military sites within the United States, its territories, and its possessions containing or suspected of containing UXO, DMM, or munitions constituents. This helped determine the size and scope of the program. Criteria are outlined in the DERP management guide.
- Ensure that specific inventory site information is entered into the appropriate DOD environmental database. For the Army, this is the Army Environmental Database—Restoration. This site information would also be used to determine initial cost-to-complete estimates and total environmental liabilities associated with MMRP.
- Develop a response prioritization protocol for each MMRP site.

The military services were directed to include not only former ranges but also all sites possibly containing UXO, DMM, or munitions constituents in the MMRP site inventory. With this clarification, the Army began moving forward with

plans to expand its current environmental cleanup program to address MMRP requirements.

Roles and Responsibilities

The Army assigned the US Army Environmental Center (USAEC) the primary responsibility for completing the inventory for all active, base realignment and closure (BRAC), excess property, Formerly Used Defense Sites (FUDS), and state-owned and -operated National Guard Bureau installations, as required by the 2002 National Defense Act. Given the vastness of the task, USAEC took a team approach, bringing together organizations with the necessary technical and project management experience. USAEC enlisted the US Army Corps of Engineers as the executing manager for the inventory project.

The Corps's experience in managing UXO projects—through the FUDS program and its Ordnance and Explosives Center of Expertise in Huntsville, Alabama—would be crucial for success. USAEC and the Corps agreed that the MMRP team should include contractor support teams, if the 2003 due date was to be met. The two organizations divided the country into three regions and selected a contractor to do the inventory in each. The work was delegated to three Corps geographic districts: the Eastern-Baltimore District, Midwest-Omaha District, and West-Sacramento District.

These teams would visit all active installations in their respective regions and perform the research required to collect the inventory data, supporting geographical information system data, and maps. A separate contractor did the work on all Army BRAC installations.

Inventory Execution and Results

In October 2001, the inventory began. This included hundreds of installation visits; intensive historical research; numerous document, installation, and site mapping reviews; and periodic team coordination and problem solving meetings. Additionally, each site was assessed for explosives safety risk using the Risk Assessment Code Methodology developed by the Huntsville Center. In total, the teams investigated more than 620 Active Army, BRAC, and state-owned and -operated National Guard installations and facilities. At these three types of installations, 1,318 sites known or suspected to contain UXO, DMM, and munitions constituents were found. In the FUDS category, 1,172 properties and 2,446 sites were identified. USAEC evaluated all active and BRAC sites for MMRP eligibility. USAEC determined that 818 sites representing 2.91 million acres were eligible for the active MMRP, and 98 sites representing more than 200,000 acres were eligible for the BRAC MMRP.

The data was uploaded in the Army Environmental Database—Restoration and preliminary restoration cost estimates were developed using the DOD-approved Remedial Action Cost Engineering and Requirements System. Each site's risk assessment code score will be used to prioritize site

response. (A new Munitions Response Site Prioritization Protocol will replace the risk assessment code methodology. Approval is expected in January 2005.) The complete list of MMRP sites will be included in the FY 2004 DERP Annual Report to Congress.

Next Steps

The IRP and MMRP have become the cornerstones of the Army environmental cleanup strategy, the Army's basic roadmap to addressing the DOD cleanup objectives. The strategy is designed to accomplish two things:

- Empower Army environmental managers to proactively address environmental contamination caused by formerly accepted Army practices.
- Ensure that timely, cost-effective, and successful business and scientific solutions—such as performance-based contracting—are implemented to protect human health and environmental safety.

Moving forward, the majority of the MMRP remediation work will be completed under the Comprehensive Environmental Response, Compensation, and Liability Act process. However, the Army is expecting that some installation work may be required to follow the Resource Conservation and Recovery Act process. With this in mind, DOD developed the following performance goals for MMRP at active installations:

- Complete a preliminary assessment for each MMRP-eligible site by the end of FY 2007.
- Complete a site inspection for each MMRP-eligible site by the end of FY 2010.



Unexploded ordnance from the formerly used defense site of Raritan Arsenal, New Jersey, 1997

Photo courtesy USAEC

The final inventory report completed for each active installation was comprehensive enough to meet the requirements of a preliminary assessment. And during the range inventory, enough data was collected to meet the requirements, so the first MMRP goal of completing preliminary assessments by the end of FY 2007 has been met. In the long run, going above and beyond from the get-go is helping the Army quickly identify and address any public safety risks.

As a result, USAEC initiated the site inventory effort in FY 2003. It reassembled its inventory teams to tackle the site inventories, ensuring that the synergy, technical expertise, and intimate knowledge generated by these organizations during the inventory phase carried over into the process. USAEC kicked off the site inventory process at 10 active installations in FY 2003 and at 18 additional active installations in FY 2004.

The MMRP site inventory at an active installation will take approximately 18 months from the kickoff meeting to the delivery of the final MMRP site inventory report. The primary objective of the MMRP site inventory is to determine whether or not a remedial investigation or feasibility study is required at a site, whether or not an immediate response is needed at a site, or if the site qualifies for no further action.

The Army's MMRP site inventory process emphasizes continuous improvement, information sharing, communication, problem solving, and lessons learned. The team has built flexibility into the site inventory process and schedule. It is committed to developing the appropriate tools to ensure that the process runs smoothly and to completing each project in the best interests of all stakeholders involved. As the responsible party, the Army wants the public to be confident of its intent and commitment to work with local communities and current landowners to design, implement, and complete appropriate munitions responses at all munitions response sites. The Army is committed to ensuring the safety of the public, to keeping the public well-informed of program activities, and to addressing community concerns.

The MMRP site inventory process and methodology involves the following principles and activities:

- **Stakeholder Involvement.** Early stakeholder involvement is key to developing the trust necessary for ensuring that the work performed during the MMRP site inventory process meets expectations and requirements.
- **Historical Records Review.** This records search documents known information for the sites involved in the MMRP site inventory effort. It also involves development of a conceptual site model.
- **Technical Project Planning.** This proven method identifies project objectives and design data collection programs for hazardous, toxic, and radioactive sites. The four-phase process ensures that the type and quality of data obtained during the project satisfies project objectives and leads to informed decisions and site closeout.

- **Site Inspection.** Developing the MMRP field work plan includes soil sampling for explosives and metals to address potential munitions constituents and appropriate geophysical work for the detection of UXO and DMM.

- **Final Site Inventory Report.** This report formally documents the results of the site inventory and includes recommended steps for the site.

These activities will help the MMRP site inventory team collect the necessary information to complete the Munitions Response Site Prioritization Protocol and to develop better and more accurate cost-to-complete estimates for each site. The team developed a program management plan and a scope of work for each MMRP site inventory installation and chose the Corps's technical project planning process as its guideline.

In FY 2005, the MMRP site inventory team also plans to incorporate performance-based contracting into its process. USAEC is now securing funding for and scheduling MMRP site inventories for the remaining 130 active installations. The process should be completed by the end of FY 2010.

As of the end of FY 2004, DOD had not set dates for the completion of remediation at all MMRP sites. Looking ahead, the Army will continue to ensure that the best and most appropriate technologies are used during munitions response actions at the munitions response sites. Regardless, USAEC is planning to fund MMRP remedial investigation and feasibility studies projects based on stakeholder input and draft site prioritization protocol data. This step could begin as early as FY 2007 or 2008 on selected active installations with completed MMRP site inventories.

For more information on MMRP or the Army's environmental programs, contact the USAEC Public Affairs Office at (410) 436-2556 or visit <http://aec.army.mil/usaec/>.



Mr. Albe serves as program manager for MMRP. He holds a bachelor's in general engineering from the United States Military Academy and a master's in business administration from Rockford College in Illinois.

Ms. Schnebly works for Booz Allen Hamilton, Inc., and serves as an outreach specialist for the USAEC Public Affairs Office. She holds a bachelor's in English from Lynchburg College in Virginia and is working on a master's in communications from Johns Hopkins University.

References

- The Army Environmental Cleanup Strategy, April 2003.
- Fiscal Year 2003 DERP Annual Report to Congress.
- MMRP Site Inventory Program Management Plan, 2003.
- Fiscal Year 2002 National Defense Authorization Act.

BALANCING MILITARY TRAINING WITH ENVIRONMENTAL STEWARDSHIP

By Ms. Sara Leach

Testing and training ranges are key elements in maintaining the capability and readiness of US military forces. Currently, the level of knowledge on the nature and extent of contamination and residues from live-fire training exercises on military ranges is not adequate to ensure sound management of these ranges. However, knowledge is being greatly expanded as the US Army Engineer Research and Development Center (ERDC) explores an array of topics such as groundwater contamination, low-order detonation, soil remediation, range management tools, and other ecological effects on training ranges.

Even though small research studies on training ranges have been performed at ERDC since 1998, research began in earnest in 2001 when the Massachusetts Military Reservation closed due to groundwater contamination. The research—

- Examined chemical processes from the micro- to macroscale.
- Determined transformation products following the alkaline destruction of explosives and propellant residue.
- Evaluated the transformation of products following alkaline destruction.
- Integrated a research program that utilized site characterization methodologies.
- Developed the best management practice to ensure continued operation of the nation's training and testing ranges.
- Included international collaboration.

The research developed technologies or advanced knowledge on various topics from molecular-level interactions to large-scale field evaluation methods. This approach emphasized the delivery of a useful product for the Army and the Department of Defense (DOD).

Live weapons and ammunition are necessary to create a realistic environment for soldiers during small arms training. The goal for research on small arms firing range soil remediation was to balance the need for this essential training with environmental stewardship. The team is developing ways to



Lead concentration in runoff water is above state limits at this M60 machine gun range.



In situ soil stabilization is being studied as a possible remedy for the lead concentration in the runoff water at this M16 rifle range.

reduce the cost of range soil remediation, eliminate migration of heavy metals from small arms ranges, and prevent toxic metals from traveling through the soil below ranges to the underlying groundwater. ERDC is developing low-cost, low-maintenance techniques to keep small arms ranges open and limit the life-cycle costs associated with the operation.

As part of the Strategic Environmental Research and Development Program, firing range research began to provide DOD with techniques to assess the potential for groundwater contamination from constituent residues of high explosives. Detecting where the contamination was coming from and what could be done about it were the primary concerns.

One aspect of this research includes determining how much chemical residue remains after the explosion of ordnance—to include trinitrotoluene (TNT), cyclotrimethylene trinitramine (RDX), and high-melting explosive (HMX). Sampling snow after a detonation has been effective in determining residue. Residue on a soil surface can't be seen, but residue on a snow surface looks like a darkened soot footprint. Snow is collected, melted, and analyzed for residue.

A "blow-in-place" method for demolition of unexploded ordnance (UXO) on training ranges has allowed characterization of the associated residues. Secondary charges, to limit the amount of residue, are being explored. The amount of high-explosives residue associated with munitions that fail to detonate completely is also being explored. These residues can become a source of groundwater contamination.

Since 2000, more than 20 ranges across the United States and Canada have been studied. With these studies, data gaps have been filled and characterization guidance and protocols

are expected to be provided to installations by the end of 2005. ERDC's firing range research is providing a direct benefit to the Army by keeping training ranges open and sustaining military readiness, while also offering proactive solutions that reduce environmental harm. The research is also providing technologies that US Army Corps of Engineers districts and divisions can use to satisfy the needs of their installation clients. Since arms training is not unique to the Army, other services can also benefit from the research completed and ongoing at ERDC.



Ms. Leach is a Public Affairs Specialist at the US Army ERDC in Vicksburg, Mississippi. She holds a bachelor's in journalism and public relations from the University of Mississippi.



Conducting an Environmental Baseline Survey in Contingency Operations

By Lieutenant Colonel David M. Wilkins

If you have ever had the opportunity to conduct an environmental baseline survey (EBS) using strict Environmental Protection Agency (EPA) guidelines, then you know it is a costly, time-consuming, and lengthy process to meet this federal requirement. A typical EBS at a base realignment and closure (BRAC) facility may take 12 to 18 months and cost \$500,000 or more. In the private sector, when conducting real estate transactions, this activity is called a Phase 1 environmental assessment (EA), performed by a registered environmental assessor (REA). In either case, whether an EBS or EA, it is often a complex and contentious issue since thousands—or more likely millions—of dollars are at stake. In addition, the urgency to gain control of the property under survey further complicates the issue.

The focus of this article is to provide a streamlined approach and a sample checklist for conducting an EBS during contingency operations.

Definition

An EBS is a technical assessment of several environmental compliance programs, combined with a survey of air, soil, surface water, and groundwater conditions. It includes a records search, personnel interviews, a photographic record, and if time and money permit, laboratory sampling and analysis of suspicious findings. The EBS often is the determining factor as to whether a full-blown remedial investigation process is required and where to focus that investigation.

Purpose

In short, an EBS is conducted because the law says we have to. The baseline survey, required before the change of tenants at federal facilities, establishes the environmental condition of the property and the nature and extent of contamination, if any, on or before the date of vacancy or occupancy. The survey must answer questions about potential environmental liability associated with the previous use of the property, potential significant adverse impacts on the community or the environment, and hazards or contamination associated with the property. Once the environmental condition is established, then accountability and liability can be clearly applied to the offending party. Even if the law did



This illegal dump was cited, but no enforcement action was taken against the violator.

not require it, it makes sense to conduct an EBS to protect oneself from environmental liability, which can be costly and punitive.

Application

During a contingency operation, you will face unique obstacles in trying to complete the EBS for your facility. For example, it is hard to conduct interviews if you do not speak the host nation language. It is difficult to do a records search when records do not exist, were destroyed by war, or are in some language you cannot read. You may not have access to satellite imagery or the ability to obtain aerial photographs. You likely do not have the resources to conduct laboratory sampling, and you certainly do not have the time to complete an EBS at the detail that is required by EPA guidelines. These are the challenges we face as engineers in performing our mission. So if you are an engineer working in a contingency operation such as Afghanistan, Iraq, Djibouti, Jordan, or Kuwait, this streamlined, four-step approach for conducting an EBS will be helpful.

Four-Step Approach to Conducting an EBS

Step 1. Perform a Site Inspection

During the first step, the following should be performed:

- A grounds inspection to determine the incidence of distressed vegetation, staining of soil, or other indications of potential contamination.
- A visual inspection of signs of dumping on the site and a determination of what may have been dumped there.
- A visual inspection for drums, vats, tanks, or other containers, that may contain illegally disposed hazardous materials and wastes.
- A visual inspection for transformers, substations, and power lines.
- A visual inspection for vent pipes, fill pipes, or other indicators of underground storage tanks.
- A visual inspection for the presence of species of threatened or endangered plants or animals.
- A visual inspection to determine if the area is a wetland or wildlife habitat.
- A visual inspection for indications of cultural or historical sites.

Step 2. Conduct Interviews

During this step, conduct interviews (with or without an interpreter), as appropriate, with personnel who may have firsthand knowledge of former or current on-site activities that may have had an environmental impact.

Step 3. Conduct Agency or Records Checks

During this step, conduct agency or records checks (with or without an interpreter), as appropriate, with personnel who may have firsthand knowledge of former or current on-site activities that may have had an environmental impact. Some good places to check include—

- State, province, territory, or municipal historical records offices or other agencies for records of land use, previous incidence of contamination, or other environmental events on adjacent properties that may have had an environmental impact.
- State, province, territory, or municipal EPA (or similar organization's) records for incidence of previous or current contamination of the site or properties immediately adjacent.

Step 4. Document the Survey

While the conduct of the survey will primarily entail a records search and an actual on-site inspection of the grounds, it may be necessary to document the discovery of any significant findings with photographs. Any photographs submitted in the report can be in black and white; however, clear, full-color photographs of good quality are most appropriate. In addition to the photographic record, provide a written report of the findings. The checklist of key areas (see page 26) is a simple and effective way to catalogue any findings made during the EBS process. It is less time-consuming than the full requirements of the EPA guidelines, yet gives the commander the power of the information he needs to protect his resources and assets. Most of the survey areas are self-explanatory, but explanations are provided when needed for clarity on selected topics.



This hazardous materials storage unit should be disposed of. It is unserviceable due to excessive corrosion and weathering.

Summary

There is no exemption from conducting an EBS just because your facility is on some distant battlefield. Remember that this survey, once completed, offers the commander a comprehensive and thorough examination of the environmental condition of the property under his control. This is critically important to assess risks to human health and the environment, environmental risks to military and civilian personnel, and the ability to effectively negotiate with the host nation on costs and requirements for using its land. The goal is to avoid liability, while at the same time to set the benchmark for our own accountability. Our government and its military commanders need bargaining power when it comes to land use. A comprehensive, scientific evaluation of the property condition will give them that power. This streamlined approach and checklist will help the base engineer and empower leaders in a contingency operation.



Lieutenant Colonel Wilkins is a team leader for the San Francisco Facility Engineer Team 20, Facility Engineer Center Southwest, US Army Facility Engineer Group. He holds a bachelor's in general engineering and a master's in environmental management. As a civilian, he is the senior construction manager for Luster National, Inc., Hunters Point Subdivision Redevelopment Project, San Francisco, California.

References

Army Regulation 200-2, *Environmental Effects of Army Actions*, 23 December 1988.

Section 102(2) of the National Environmental Policy Act (NEPA) of Sections 4321 to 4370, Title 42, United States Code.

Checklist of Key Areas

1. Document Title: Environmental Baseline Survey of _____		
2. Survey Administrative Data		
a. Date of site survey: _____		b. Assessment performed by: _____
c. Personnel contacted on site:		
Name/Grade	Duty Position	Telephone Number/Email
3. Document Date: _____		
4. Site Survey Data:		
a. Description of the site:		
Installation(s)		
(1) Installation name: _____		
(2) Installation number: _____		(3) Facility identification: _____
(4) Street address: _____		
(5) City/town: _____		(6) State/province: _____
(7) Zip code: _____		
(8) Command jurisdiction: _____		
Facility Type		
United States Army Reserve Center (USARC):	Armed Forces Reserve Center (AFRC):	Organizational maintenance shop (OMS):
Flight:	Direct support (DS) general support (GS):	Medical:
Wet:	Flight:	Equipment concentration site (ECS):
Combined task force (TF):	Other:	
(9) Description and condition of the property: _____		
(10) Description of the training area(s): _____		
(11) Description of the adjacent land usage: _____		
b. Description of the proposed site usage: _____		
c. Current environmental conditions		
Summary of the Site Conditions		
Air quality:	Drinking water:	Waste water:
Hazardous materials:	Hazardous waste:	Solid waste:
Medical waste:	Petroleum distribution points:	Noise:
Pesticides:	Historic and cultural resources:	Natural resources and endangered species:
Polychlorinated biphenyls (PCB):	Asbestos:	Radon:
5. Soil Type and Land Cover: _____		
6. Topographic, Hydrologic, and Geologic Features: _____		
7. Unexploded Ordnance: _____		
8. Sanitary Waste Disposal: _____		
9. Heating and Ventilation Systems: _____		
10. Electrical Associated Hazards: _____		
11. Fire Protection Systems: _____		
12. Radiological Hazards: _____		
13. Site Survey Maps: _____		
14. Photographs: _____		
15. Samples: _____		
16. Related Documents: _____		
17. Outside Agency Assisting on Document: _____		
18. References Used:		
a. Army Regulation (AR) 200-2	b. Section 102(2) of the National Environmental Policy Act (NEPA):	c. Air Force Instruction (AFI) 32-7066 Environmental Baseline Surveys in Real Estate Transactions, 25 April 1994:
d. American Society for Testing and Materials (ASTM) Designation E-1527-93, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process	e. 2003 Environmental Compliance Assessment	
19. Satellite Imagery or Aerial Photographs: _____		
20. Incidence of Distressed Vegetation, Staining of Soil, or Other Indications of Potential Contamination: _____		
21. Signs of Dumping On-Site and Determination of What May Have Been Dumped There: _____		
22. Inspection for Drums, Vats, Tanks, or Other Containers Which May Contain Illegally Disposed Hazardous Materials or Wastes: _____		
23. Inspection for Transformers, Substations, and Power Lines: _____		
24. Inspection for Vent Pipes, Fill Pipes, or Other Indicators of Underground Storage Tanks: _____		
25. Presence of Species of Threatened or Endangered Plants or Animals: _____		
26. Wetland or Wildlife Habitat: _____		

Sample checklist for cataloging findings during the EBS process

Getting to the Root of Contamination

By Ms. Marie C. Darling

Researchers with the Engineer Research and Development Center (ERDC), Cold Regions Research and Engineer Laboratory (CRREL), have been treating petroleum-contaminated soils in remote, cold areas by using root-microbial processes. According to a fact sheet released by the Alaska Department of Environmental Conservation, Spill Prevention, and Response Division, petroleum is the most common contaminant in Alaska.

The Department of Defense (DOD) has used a wide variety of petroleum products—including gasoline, diesel fuel, heating oil, jet fuel, lubricating oil, bunker oil, and tar—all of which are refined from crude oil. Many petroleum products contain benzene and polynuclear aromatics, known carcinogens to people and animals.

Most petroleum contamination in Alaska comes from leaking storage tanks, containers, and pipes (with undetected leaks underground); leaking equipment; transportation accidents; and improper handling and disposal practices. Many DOD sites are so remote that transport and operation of traditional cleanup systems are impractical or too costly. Some sites are underlain by permafrost and are vulnerable to environmental damage.

Natural attenuation, the most cost-effective treatment for remote contaminated sites, is often inhibited by a lack of nutrients, a lack of mixing, highly dynamic moisture and temperature conditions, and a short treatment season. One recommendation is to identify a means to enhance natural attenuation processes and effectively monitor the enhancement to cost effectively treat hundreds of petroleum-contaminated sites in remote, cold regions.

Modifying soil conditions by introducing plants with diffuse root systems exploits the rhizosphere effect. The rhizosphere is a zone of enhanced microbial activity in soil near plant roots. Using the rhizosphere effect takes advantage of a host of natural cycles and processes. For example, plant roots exude excess carbon, which stimulates microbial activity and biodegradation near the roots. As roots explore the soil, microbial activity is enhanced for increasing percentages of soil and results in "pseudo-mixing" without the need to physically till the soil.

In early laboratory experiments at CRREL and field studies in Fairbanks, Alaska, successful plant germination, plant growth, and root intrusion in both crude oil- and diesel-contaminated soil were successful. Cold-tolerant grasses,

especially annual ryegrass and Alpine bluegrass, appeared to germinate and grow in petroleum-contaminated soils. There were greater numbers of bacteria in the rhizosphere soil compared to unvegetated bulk soil and an increase in the percentage of soil microorganisms that can degrade model organic contaminants. And most significantly, the vegetated soil treated with nutrients increased remediation rates and reached a lower endpoint concentration than unvegetated or untreated soils.

For the past five years, researchers have further investigated earlier findings by conducting field studies of rhizosphere-enhanced treatment at three geographically diverse sites in Alaska—Barrow (north slope), Galena (interior), and Annette Island (southern)—and two sites in Korea. Results show a significant beneficial plant effect, and the effect is more pronounced for recalcitrant compounds. Surprisingly, the data show that nutrient additions alone can slow or inhibit biodegradation of recalcitrant compounds relative to either the vegetated or control treatments.

The Army Environmental Quality Technology Program, the Strategic Environmental Research and Development Program, and the Environmental Security Technology Certification Program supported this research. The findings have implications for live-fire range sustainability and understanding the persistence and fate of chemical-biological agents, both involving microbially driven surface-soil phenomena. By providing a science basis for low-cost treatment at remote sites, results of this research will benefit DOD and residents of Alaska.



Ms. Darling is a public affairs specialist with the ERDC Cold Regions Research and Engineering Laboratory located in Hanover, New Hampshire.

These plants in a contaminated soil landfarm in Fairbanks, Alaska, provide a field study to evaluate the rhizosphere effect.

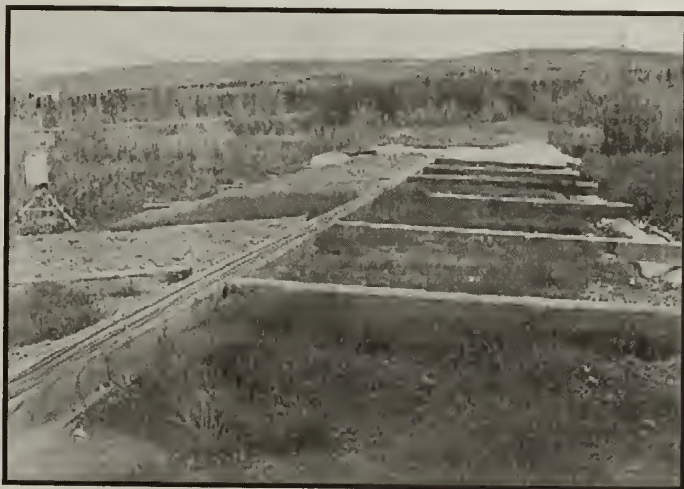


Photo courtesy C.M. Reynolds, ERDC/CRREL

BEING AN ENVIRONMENTAL OFFICER IN A FACILITIES ENGINEER DETACHMENT

By Major Glen L. Jackson

Many US Army Reserve and National Guard soldiers join up for the opportunity to do something different during their monthly drills and annual training. That was certainly true when I first joined a National Guard armored cavalry troop. Leading a platoon of Bradley fighting vehicles was very different from my civilian job at that time as a district conservationist for the US Department of Agriculture (USDA) Soil Conservation Service. However, changes in both my civilian job and Reserve unit led me to perform almost identical tasks when I was deployed to Iraq as part of Operation Iraqi Freedom in February 2003.

I deployed as part of Detachment C, US Army Facility Engineer Group (USAFEG). USAFEG units are facility engineer detachments (FEDs) or facility engineer teams (FETs) that assume the functions of a Directorate of Public Works (DPW) at contingency bases of operations. FEDs and FETs have been deployed to Afghanistan and throughout the Middle East since the beginning of combat operations in the US Army Central Command (CENTCOM) area.

My position with the FED during peacetime was as an environmental officer. In my civilian job, I am an engineer for Westinghouse Savannah River Company (WSRC), which operates the Savannah River Site for the US Department of Energy. At WSRC, my responsibilities have included engineering support for storage and off-site shipment of



This is one of the many UXO caches that was documented as part of completing the EBS for the MND.

hazardous waste, writing contracts for hazardous waste disposal vendors, and performing certification audits on prospective vendors. I am involved in the chemical and radiological characterization of radioactive waste destined for disposal at the Waste Isolation Pilot Plant in Carlsbad, New Mexico. While in Iraq, I used much of the formal training and field experience I gained at WSRC.

While in Arifjan, Kuwait, my detachment received its first tasked mission as a FED—to conduct an environmental baseline survey (EBS) for the base where we were stationed. An EBS establishes the baseline environmental “health” of any building, facility, or area scheduled for occupation by US Army and coalition forces for more than 30 days. The survey identifies environmental and health risks associated with the site and provides unit commanders with the information needed to avoid or reduce exposure risks. An EBS determines any obvious threats to human health and safety (such as unsafe structures, polychlorinated biphenyl [PCB] leaks, and loose asbestos) and documents preexisting environmental contamination on a site before its use by US or coalition forces.

The base, known as Logistical Support Area (LSA) Adder, in southern Iraq on the outskirts of An Nasiriyah, is located on Tallil Airfield, a former Iraqi Air Force Base. At that time, the 171st Area Support Group (ASG) operated LSA Adder.



PCB fluid had leaked from this destroyed electrical transformer on Al Kut Airfield in western Iraq. All high-voltage electrical transformers were considered to have PCB contamination due to the age of the transformers.

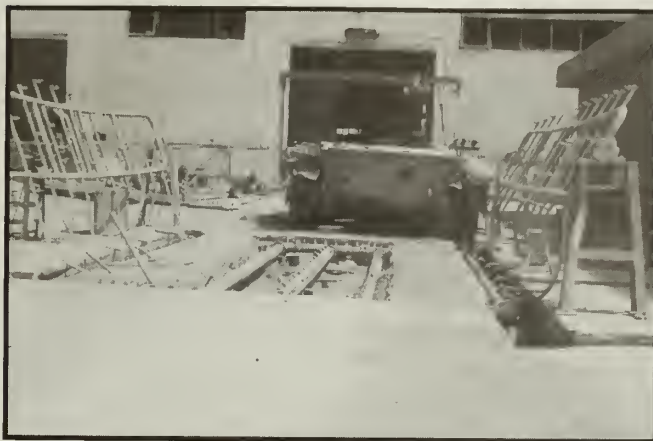
As with projects in the civilian world, the EBS took more resources than my attachment could provide. Fortunately, the 520th Theater Army Medical Laboratory (TAML) was also stationed on LSA Adder. This unit had an extensive amount of laboratory equipment for analyzing soil and water samples. In addition, the base had an Air Force bioenvironmental section. Personnel from both of these units assisted with the EBS.

As part of the EBS, it was necessary to document locations of exploded and unexploded ordnance (UXO). The UXO—both Iraqi and US—left over from the first Gulf War littered the ground, often only a few feet apart. Either the Army or Air Force explosive ordnance disposal (EOD) teams took us to these areas. That is one situation that my civilian job had not prepared me for—walking through areas where there was UXO lying on the ground.

Part of the EBS process is to conduct a site closure survey for units that are departing a base. One of the first units to depart Tallil Airfield was a Patriot missile battery. Before the battery returned to the continental United States, they changed the fluids in their vehicles and segregated the waste into drums of used oil, antifreeze, and oily rags. They used a large building with a damaged roof to store the waste and to help protect it from the elements. This building was the first hazardous waste storage facility in the Iraqi area of operations. My detachment gained ownership of the building from the 170th ASG land manager. We tasked the 170th direct-support maintenance battalion to operate the facility. Drawing on previous experience with hazardous storage facilities, I wrote the standing operating procedure (SOP) for its operation and the waste acceptance criteria that units had to follow to transfer waste to the building. While most of the waste was common to maintenance operations, some of it was unusual, such as the spent photographic fixative from the X-rays processed at the South Korean hospital on the base.



This building had been slated for use as a laundry facility by Kellogg Brown & Root, Inc. (KBR) in support of the MND forces. The asbestos tile roof had fallen in and covered the floor. KBR was advised to use another building until proper asbestos cleanup could be done.



Heavy industrial sites like this Iraqi tank and armored vehicle depot-level maintenance facility posed a great environmental risk, due to the lack of controls for disposing of hazardous chemicals.

At this time, there was no general CENTCOM directive on managing hazardous waste, which meant there was no high command guidance. Most of the maintenance personnel were using the same environmental practices that they followed in the United States. However, they ran into a problem because they had no destination for the waste.

An outgrowth of the Patriot missile battery maintenance program was the establishment of the petroleum, oils, and lubricants (POL) reutilization program. During the site environmental closure survey, the battery left behind its unused drums of POL products and other chemicals and fluids used in maintenance operations, and these materials became the starting point for our POL reutilization center. The departing units transported their unused POL products to this location so that remaining units could use the supplies.

People generally assume that Army engineers are familiar with all types of Army engineering. So it was with environmental work. I was called in a number of times as the resident subject matter expert for safety and industrial hygiene concerns. The first was when Tallil Airfield was still using burnout latrines (old 55-gallon drums). I was looking at the labels of two drums that were about to be cut in half with a cutting torch and noticed that one of the labels stated that the material previously contained in the drum was toluene diisocyanate. From my civilian training, I knew that any cyanate material was a health hazard. I stopped the cutting of the drum, looked up the material safety data sheet (MSDS) information on the drum, and discovered that the material produces toxic fumes when exposed to high heat, such as being cut with a cutting torch.

My experience with completing EBSs led to an assignment to a multinational division (MND) in Babylon for a month. The mission was to complete an EBS for each of the 12 sites where the MND forces were to be stationed. Along with completing the EBS, I was to write the environmental SOP for the MND. This was the hazardous materials/hazardous waste

(Continued on page 31)

Bat Men:

Scientists Help Protect Bats on Military Installations



By Ms. Stefanie A. Gardin

In a joint project between the Engineer Research and Development Center (ERDC) Environmental Laboratory (EL) in Vicksburg, Mississippi, and its sister laboratory—the Construction Engineering Research Laboratory (CERL) in Champaign, Illinois—a team of scientists are combining technologies to study activities that may threaten bats on military installations. Increasingly, military installations are becoming hot spots for endangered species such as the Indiana and gray bats. For the past 30 years, many of these installations, which were once in remote locations, have become surrounded by suburban developments, causing wildlife to seek refuge on the less inhabited training lands. As a result, protection and conservation of plants and wildlife—particularly threatened and endangered species—on military installations and Department of Defense land is becoming an increasingly important mission for the Army and the US Army Corps of Engineers.

Most major installations have conducted at least a preliminary survey of their fauna, which has included a survey of bats. The surveys identified a couple of endangered species on approximately 20 installations. Of the 45 species of bats in

the United States, about half are considered species of concern, and six species are endangered. From a biological diversity aspect, bat populations are in need of help.

At Fort Knox, Kentucky, the team is in its last year of a three-year study on the effects of military noise, which has been identified as an environmental concern on bat activities—specifically bat navigation and feeding. The Army is sponsoring the study as part of the Army Environmental Quality Research Program.

Fort Knox is home to the US Army Armor Center. With six active tank ranges, there was a high probability of getting the high-caliber weapons fire at night that the team needed for their project. Fort Knox was also selected because the Indiana and gray bats are located there. In addition, personnel at Fort Knox, both in the environmental office and in the range control office, were willing to cooperate on the project.

The concern is that military noise, primarily high-caliber weapons fire, might have some impact on the bats' ability to feed and use their resources for survival. The team is focusing on the fire from 120-millimeter tank rounds, but it is also recording, translating, and interpreting noise from 25-millimeter rounds from Bradley M2A3 fighting vehicles, .50-caliber machine guns, and helicopter overflights.

Several other technologies are being used to carry out the research. One such technology is the Anabat II, an ultrasonic bat detector. The Anabat II picks up the high frequency of bats calling to a distance of 30 to 40 meters. These signals are then relayed to another device and on to a computer. Several software programs are used to interpret the signals so that the scientists can locate the bats and, to a large degree, determine what species they are hearing.

The problem with ultrasonic bat detection is that sometimes it is difficult to hear the different species of bats that inhabit an area. That is where thermal infrared imagery comes in. Basically, a thermal infrared camera is used to observe bat



Gray bat



Anabat II ultrasonic bat detector

activity using heat sensors. It picks up bat activity to about 100 meters. The bats appear as warm shapes against a cool background. Thermal infrared imagery indicates to scientists the number of bats in an area and, to some extent, what they are doing—whether the bat is flying in a feeding pattern or just flying by.

The team of scientists is taking a new approach using several different technologies. It is believed to be the first time that all this is being combined, and that is the innovation of the project—trying to pull these technologies together to get more and better information than we have in the past. The team has set up 31 sample sites at Fort Knox—some right behind firing lines, others farther away. Using the Anabat II, thermal infrared imagery, and sound data from military guns, the team can look at bat activities before, during, and after firing at the various sites and determine what effect the noise has on the bats.

Still in the analyzing data stage, outside factors such as the weather can also heavily impact bat activities and must be taken into account. The team completed its last field event during the summer of 2004. When it finishes the study, the team will offer appropriate management recommendations to Army installations, based on the results and interpretations.

The team experienced long and trying days in the field, but because of the research conducted, a difference is being made in the Army and the environment—increasing awareness and protection of threatened and endangered species. 

Ms. Gardin is a Department of the Army intern in public affairs. She is currently assigned to the Engineer Research and Development Center in Vicksburg, Mississippi.

(Continued from page 29)

management policy that all the units under the MND would follow.

While there, I used the safety training that had been instilled in me at WSRC. The Savannah River Site originally had been built and run by DuPont, Inc.TM, which is a world leader in industrial safety, and WSRC adopted this tradition when it assumed the contract to operate the Savannah River Site.

One morning, I walked past a Marine maintenance shop where two young Marines were filling lead acid batteries with sulfuric acid. They did not have on safety glasses, gloves, or plastic aprons—standard personal protective equipment for this type of task. Although they were not in my chain of command, I remembered the old slogan, “Safety is Everyone’s Responsibility.” I went back and reminded them of the needed equipment, that they only had two eyes, and that I was sure they wanted to go home with both of them functioning. From the look on their faces, I could tell they knew what they were supposed to be doing and had been taking a shortcut.

As an environmental officer, you have to be prepared to be the on-scene expert on industrial hygiene and safety issues. The one item I would be more prepared for next time is to take a good set of technical references. If Internet services are not established, a hard copy is the only way to find the information to determine if a particular chemical is a safety hazard.

Though I was able to see a very different part of the world during my deployment, many of my duties were very similar to what I had been doing in my civilian job. This is one of the great strengths of the Reserve and National Guard system. Its members can bring to bear a great deal of previous expertise and experience during military operations. 

Major Jackson is the environmental officer for the Fort Jackson FET, Facility Engineer Center-Southeast, US Army Facility Engineer Group. His military experience includes active duty in Fort Knox, Kentucky; Fort Stewart, Georgia; and Fort Leonard Wood, Missouri. He has served in nonactive duty status for the Army National Guard in Newnan, Georgia; Edgefield, South Carolina; and Fort Mill, South Carolina. In addition, he has served in the US Army Reserve at Fort Jackson, South Carolina, and in his present position. As a civilian, he is the Senior Engineer A for Westinghouse Savannah River Company. He holds two bachelor’s degrees, one in range resources and another in chemical engineering.



A Remedy for a Chronic Dredging Problem

By Mr. David C. Gordon

The US Army Corps of Engineers (USACE) recently constructed a set of innovative river training structures in the Upper Mississippi River to remedy a repetitive maintenance-dredging problem. Due to the complexity of this reach of river, the problem required the development of a unique solution to meet the objectives of numerous user groups and agencies involved.

The reach of river, called Bolters Bar, is located about 45 river miles upstream of St. Louis, Missouri (just upstream of the confluence with the Illinois River). It is used heavily by commercial navigation tows and is part of a crucial link between the Upper and Lower

Mississippi Rivers. At this location, the river is divided into as many as four separate channels, with one of the densest concentrations of marinas and recreational boats along the entire Mississippi River. In the summer months, thousands of recreational boaters regularly use these channels.

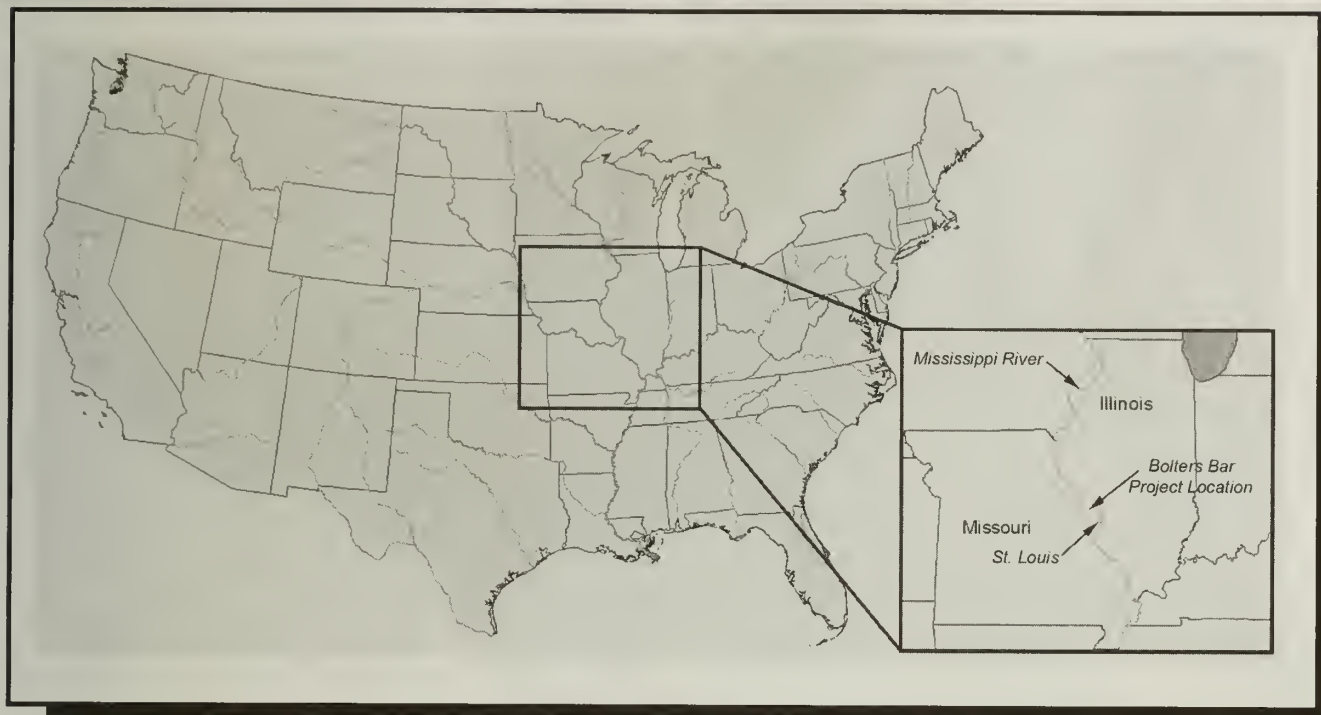
USACE is responsible for maintaining a navigable channel at least 9 feet deep by 300 feet wide on the Upper Mississippi River, through the use of river training structures, dredging operations, and water-level management at the locks and dams. This reach of river had required dredging—usually once or twice a year—due to depths that did not meet the minimum requirements. In most

years, dredging was needed during the fall harvest—the busiest period for shipping agricultural products down the Mississippi River for export. During crucial shipping periods, groundings could close the river down for days for cleanup.

In terms of dredging frequency, this reach has been one of the most troublesome on the Upper Mississippi River. Within this 1-mile reach, more than 5.5 million cubic yards of river sediment have been dredged at a cost of over \$6.1 million. The most recent dredging operation to reopen this channel in 2001 took 12 days to remove more than 300,000 cubic yards of sediment at a cost of almost \$500,000. Locating viable dredge



Innovative river training structures remedied a chronic dredging problem and created unique aquatic habitat.



Bolters Bar project location map

disposal areas that would not negatively impact recreation, homeowners, or the environment has also proved problematic.

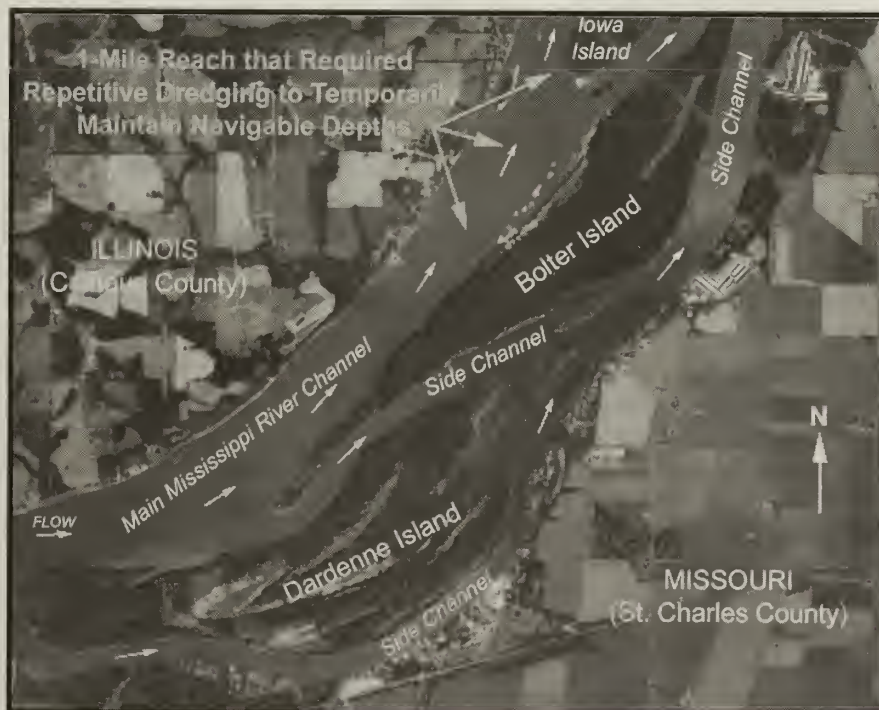
One cause of repetitive dredging through the reach was the loss of flow in the main channel to the side channels. Measurements of flow distribution show that, at times, the main channel carries less than 50 percent of the total flow in the river while the majority of water flows through the side channels.

A conventional solution to the problems would have been to construct rock closure structures across the mouths of each of the side channels. This measure would have distributed additional flow in the main channel at the expense of the side channels. However, closing off the side channels would have adversely affected the environment of the river and recreational boaters. Therefore, USACE needed a way to evaluate unconventional designs that would reduce the repetitive-channel, maintenance-dredging situation without damaging the environment or creating problems for recreational boaters. Assessments of needed alternatives included examination of the ultimate effects to sedimentation patterns within

the main channel, at the entrances to the side channels, and within each side channel.

To accomplish assessments of multiple designs, a small-scale, physical, hydraulic, movable riverbed model was used. This micro model not only allowed engineers to test numerous design

alternatives in a detailed manner but also allowed for the involvement of the USACE partners during the design conception phase. One of the advantages of a physical model is the interaction it provides for customers and partners. Complex river concepts can be visually observed and understood by



Area requiring repetitive dredging



Bolters Bar Micro Model

nonengineers, which creates a team-building experience with all interested parties. This process ensures that all those involved in the project agree on the final design.

USACE uses micro modeling technology for both plan formulation and final design parameters. These physical, hydraulic models of a river or stream use small-scale and movable riverbeds. The modelers use empirical techniques to replicate the trends of the riverbed to study sediment distribution and riverbed pattern development within a river channel. This includes the general location of sandbars, the depositional areas, the scour holes, and the channel

thalweg (the line of the deepest water in the river channel). The modeling then allows for the estimated prediction of riverbed patterns when applying a structure in the river channel.

The model used to study the Bolters Bar reach was developed at the USACE Applied River Engineering Center, St. Louis, Missouri. The model—which incorporated almost 11 miles of the main river channel, as well as each side channel and every river training structure—was only 6 feet long and 3 feet wide. The bed material used to simulate the riverbed of the Mississippi was a granular plastic.

Surveys of the river bottom were used to calibrate this model. The plan formulation team then used the model to idealize numerous design possibilities for consideration by the design team. These concepts were later scientifically tested in the model to determine their probable effect on the riverbed. Results of these tests were then presented to the plan formulation team for evaluation.

The micro model showed that numerous designs using traditional river engineering concepts would greatly reduce dredging. Standard dike fields placed along both banks would direct the river flow into the center of the channel, thereby increasing depths. However, the means of solving traditional dredging issues with standard engineering practices were not acceptable to the environmental agencies and recreational interests. Therefore, combinations of dikes and chevron structures that would also address environmental concerns were evaluated in the model. Chevrons are large U-shaped rock structures with blunt noses and open ends that face downstream.

Most of the designs tested in the model showed that probable improvements to dredging could be gained from each combination of structure. However, the designs were also evaluated on their effects within each side channel, the alignment for navigation, and the capacity to create additional aquatic habitat. These parameters were then weighed with the costs associated with each design to determine the most economical solution.

The team agreed on an unconventional design that addressed the needs and concerns of everyone involved. The design consists of a unique longitudinal dike and four chevron structures. The 1,200-foot-long longitudinal dike extends off of Bolter Island and is angled downstream in a nearly parallel alignment to the flow of the river. Downstream of this structure are four chevrons about 850 feet apart and built of graded 5,000-pound, maximum-size stone. The chevrons are



USACE biologists collect fisheries data around a chevron at Bolters Bar

about 250 feet long, 200 feet wide between the downstream ends of the legs, and 600 feet in total length along the perimeter of the structure. The project was completed in 2002 at a cost of nearly \$1.5 million for about 160,000 tons of stone.

Although the structures have only been in the river for two years, the results have been outstanding because the reach has not required dredging. After the project was completed, surveys showed that the minimum depth and width required for navigation had been created by the structure's interaction with the river and its sediment. Areas that used to be less than 10 feet deep are now at least 15 feet. In addition, the navigation channel is now wide enough that, on occasion, tows have been able to overtake one another without incident. Monitoring of the side channel immediately downstream of the structures shows that shoaling has not occurred, and depths have been maintained, just as the micro model suggested. The surveys of the river suggest that the micro model accurately predicted the effect that the design has on the trends

of the riverbed. As an engineering tool for the prediction of bathymetry trends in a continually changing river environment, the predictive accuracy displayed by this model was at an exceptional level.

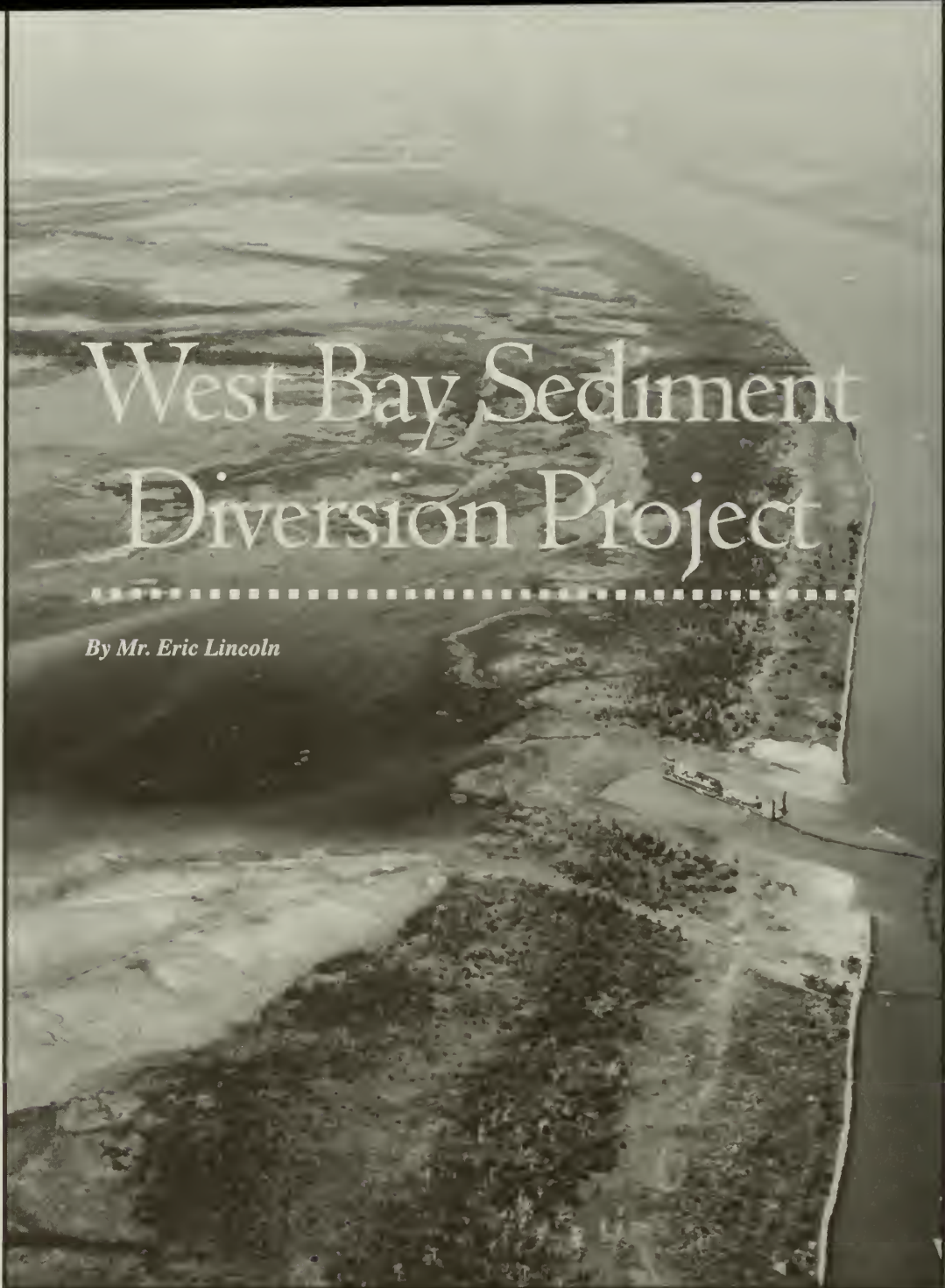
Although biological monitoring can take years to assess, the results from similar chevrons give a valid representation of what could be expected to occur in and around these structures. Six other chevrons built in the 1990s have been extensively monitored for their biological effects. More than 50 species of fish and a highly diverse group of macroinvertebrates have been collected in and around the structures. Physical data has shown that these structures have created several different types of river habitat with variable depths, flow velocities, and substrates and multiple wetted edges where plant life can flourish. It has been documented that this environment is very conducive to the needs of overwintering fish and provides ideal conditions for a nursery for juvenile and larval fish. Plant life that establishes itself along the wetted edges provides good cover and habitat for

young fish. The chevrons built in the Bolters Bar reach are expected to result in the same diverse group of habitat types and species benefits.

This unconventional solution to a troublesome problem has the potential to save millions of dollars in dredging costs. It is estimated that this project will pay for itself after just three years. Although the total cost of the project was \$1.5 million, \$500,000 was spent in one year of dredging in 2001. Additionally, there are monetary values that result from increased safety and the reduced risk of accidents or groundings. The navigation industry as a whole incurs significant costs from events such as those that close the river to traffic for any amount of time. The environmental benefits have also been immense, but they are difficult to quantify. The project provides a mosaic of aquatic habitat not readily found along the river, such as deep slack water, off-channel nursery areas, and aquatic vegetation.

Since construction, tow pilots have not encountered any navigation problems and have been pleased with

(Continued on page 37)



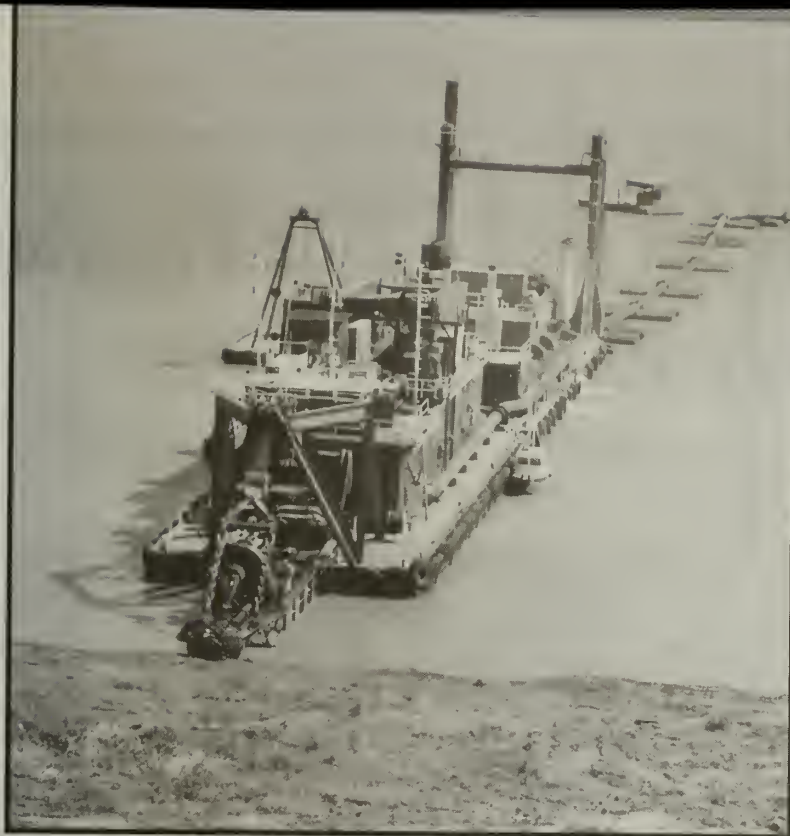
West Bay Sediment Diversion Project

By Mr. Eric Lincoln

The West Bay Sediment Diversion Project, in southern Louisiana, opened in November 2003, introducing fresh water and sediment from the Mississippi River into West Bay to help rebuild about 10,000 acres of vegetated wetlands over the next 20 years. The project is located in Plaquemines Parish, 5 miles above Head of Passes, and is the largest of its kind in the world. It is a major sediment diversion without control gates that will also be a model for future diversions.

Dating back to the 1950s, a number of storm events, natural subsidence, and a lack of sediment and freshwater introduction into the bay led to the disappearance of the wetlands, creating an area of mostly open, shallow water. The project will result in a 20,000-cubic-feet-per-second diversion for a few years. And if it works well, the channel will be dug to increase the flow to 50,000 cubic feet per second.

The project's primary purpose is to rebuild marsh. The project performance is of great interest, not only as it pertains to this project but also to the application of future projects in the Coastal Wetlands Planning, Protection, and Restoration Act and Louisiana Coastal Area (LCA) programs. The LCA study team may use the data collected to support approval and funding for possible future diversions in Plaquemines Parish above Lake Maurepas at



West Bay sediment diversion

Myrtle Grove (about 50 miles upriver from West Bay) and near Fort Jackson (about 20 miles upriver from West Bay) along the Mississippi.

The project consists of three phases: removal of a foreshore dike, construction of the initial channel, and removal of advance maintenance-dredging material from the Pilottown anchorage—which is adjacent to the river—to protect navigation during the sediment diversion.

Vessels use the anchorage to transfer crews and await further transit up the river. Analysis indicated that the navigation channel and the anchorage area would both be subject to additional shoaling from the water removed through the diversion. As part of the project, the US Army Corps of Engineers agreed to maintenance dredge to a depth of 45 feet, allowing deep-draft ships to continue to use it as they have in the past. It is critical to the shipping industry to be able to use that area.

The dredge *California* began digging the West Bay channel in late September 2003. Most of the channel was solid riverbank, so rather than wait for the area to be cleared before dredging, the contractor laid pipeline to begin pumping

material, while at the same time working to clear away trees and shrubs.

All of the material from the riverbank where the channel is created and from the anchorage area is ultimately being pumped into West Bay for the creation of wetlands. Because the area is mostly fresh water already, there should be no major reduction in salinity or negative impact on existing fisheries once the diversion is opened. The district has been working on this for more than 10 years, with a great team effort all across the agency and with the local sponsor, the Louisiana Department of Natural Resources. The federal government is funding 85 percent of the \$22.3 million cost, and the state is funding 15 percent.

As of September 2004, the project had successfully passed its first high-water season and created 189 acres of new land. Approximately 70 percent of the newly created wetland has been colonized naturally with native wetland plants.

Mr. Lincoln is a public affairs specialist with the US Army Corps of Engineers, New Orleans District, and the editor of the district's magazine Riverside. He is a graduate of the University of New Orleans.

(Continued from page 35)

the results of channel improvements. And once recreational boaters became familiar with the location of the new structures in the river, they did not express any concern over the project.

This project demonstrated that it is possible to remedy a difficult navigation problem in an area where multiple user groups had a strong desire to protect their own interests. The use of the micro model allowed engineers, biologists, tow pilots, and environmentalists the unique opportunity to work together to experiment with and design nontraditional river engineering solutions that may not have been considered with other design techniques. The results of this novel project have shown that it is possible to achieve a "win-win" scenario between navigation interests and the environment.



Mr. Gordon is a senior river engineer for the St. Louis District Corps of Engineers at the Applied River Engineering Center (AREC). He assists in leading a staff of engineers and technicians who perform micro model studies of the Mississippi, Missouri, Kaskaskia, Illinois, and Atchafalaya Rivers. He has been the primary designer of many river engineering design measures that have solved a number of problems, including repetitive-maintenance dredging. He has authored several technical papers and has made presentations at sedimentation conferences. In 2004, Mr. Gordon received the International Navigation Association's De-Paape Willems award for the US Section. He recently visited Uzbekistan to design port facilities for the Uzbek Border Patrol unit.



US Army Installation Restoration Program Performance-Based Contracts

By Mr. Randy Cerar

Before the introduction of environmental laws in the 1970s, Army employees and contractors disposed of contaminants in accordance with the best and safest known engineering practices of the time. Previously acceptable disposal practices, coupled with decades of training and operations on Army property, have resulted in environmental concerns at many Army installations.

Status of the Installation Restoration Program

About three decades ago, the Army began formal studies into the impact of past disposal, training, and operations practices on the environment. Based on the results of those studies, the Army made a commitment to clean up environmental contamination. The Installation Restoration Program (IRP) was initiated for both active and excess installations; the goal was to complete cleanup of 1,080 installations by the end of fiscal year 2014. Cleanup under the

Photo by Jean Skillman, USAEC



An environmental scientist monitors the injection pressure of the in situ remediation at Fort Leavenworth, Kansas.



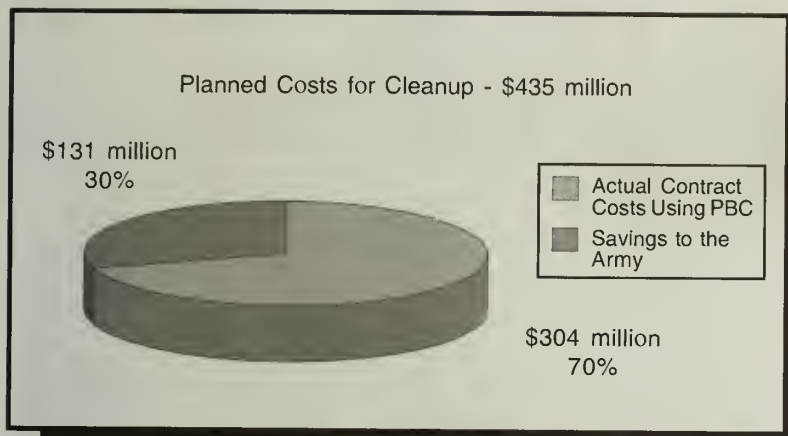
Photo by Jean Skillman, USAEC

Groundwater samples are collected in vials at Fort Leavenworth, Kansas, for laboratory analysis. Volatile organic compounds are analyzed on a regular basis, and the results help determine the effectiveness of the remediation.

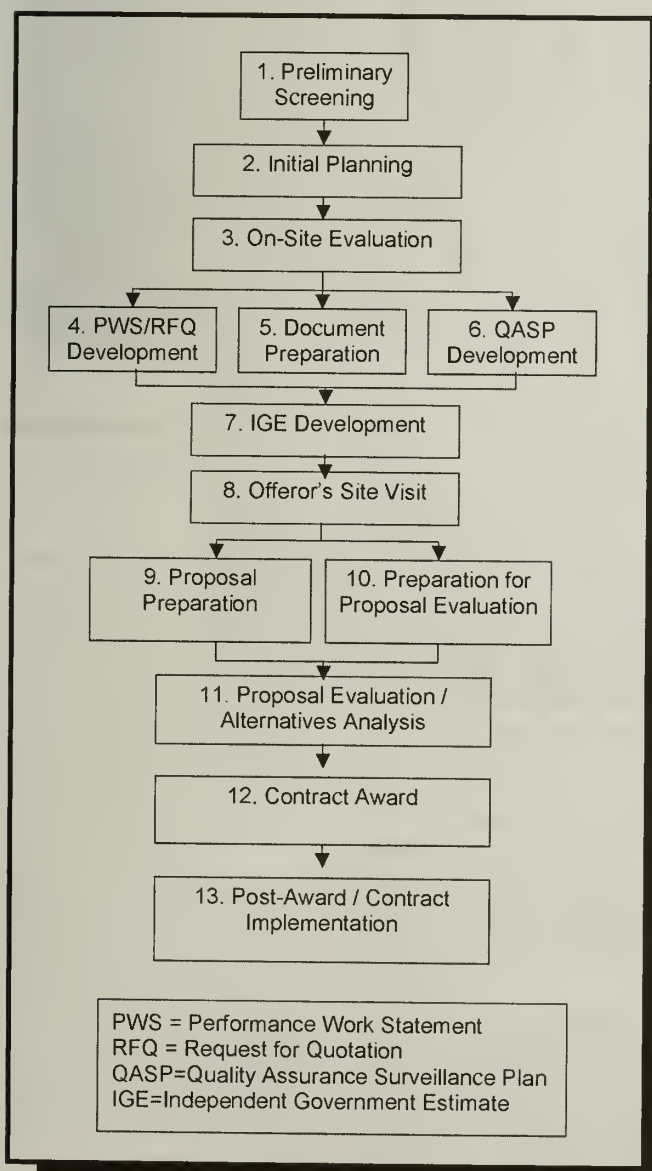
IRP, which is now about 90 percent complete, has cost \$4.9 billion. Closeout of the remaining 10 percent of the sites is expected to be challenging, as schedules have slipped, cost-to-complete estimates have increased, and installations have been achieving only 60 to 70 percent of their planned milestones. Many of the remaining sites are the most technically challenging cleanup projects. In many cases, multiple technology demonstrations have been conducted in an effort to clean up the residual contamination.

A Change in Army Strategy

Armey leaders realized that in order to complete their restoration mission, business practices would need to be changed. Consequently, in 2002, the Army implemented the use of performance-based contracts (PBCs) for environmental cleanup. Performance-based contracting originated from reforms mandated to all federal agencies by "The President's Management Agenda." These reforms emphasize *results* rather than *process*. Using PBCs, the government does not dictate *how* contractors who have been hired to conduct environmental cleanup will achieve project



Performance-Based Contract Savings



Phases in Implementing PBC for Active Army Installations

objectives—only that they *will* achieve those objectives. This approach allows military services to purchase safe and effective environmental cleanup for a fixed price and under a set schedule. Because the Army no longer dictates how private firms will conduct the cleanup, the firms have more flexibility to solve cleanup challenges in a cost-effective way. PBCs can also be used to implement innovative solutions to challenging technical problems and allow for incentives for private industry to take on these more difficult projects.

Performance-based contracting requires the contractor of an environmental cleanup project to achieve specific objectives outlined in a performance work statement—normally for a fixed price. The contractor may be required to buy insurance to offset the risk of additional costs if cleanup expenses exceed the contract price. A PBC for environmental cleanup does not relieve the Army of the ultimate environmental liability for the project. However, it does shift more responsibility and accountability for the cost, schedule, and results of the project covered by the contract from the Army to the contractor.

To date, the Army has awarded 21 PBCs, totaling approximately \$304 million. When the award costs of the PBCs are compared to cost estimates for traditional “cost plus fixed fee” types of environmental contracts, the Army savings are estimated to range between 17 and 30 percent.

Lessons Learned

While reviewing the efforts of other services and agencies in applying this contracting strategy, the Army learned several valuable lessons. Three of the most important were that—

- Specific and clear performance work statements minimize communication problems.
- Early communication with the regulatory agencies ensures that accurate objectives are set forth.
- Consolidation of common documents reduces the workload for reviewing agencies.

For specific examples of how various installations have used performance-based contracting, see the US Army Environmental Center (USAEC) Web site at <http://aec.army.mil/usaec/cleanup/pbc00.html>.



Mr. Cerar serves as the Technical Director of USAEC at Aberdeen Proving Ground, Maryland, where he manages conservation, restoration, compliance, and pollution prevention activities and related program operations in support of the Army's environmental programs. He holds a bachelor's in chemical engineering from the University of Pittsburgh.

Protecting the Environment

By Mr. Thomas O'Hara III



Photo by Thomas O'Hara III

Protecting the environment is one of the principles of the US Army Corps of Engineers (USACE) operations throughout the world. Some might argue that in a hostile environment, such as that in Iraq, attention to environmental concerns would take a back seat to engineering operations. Those people would be surprised to learn that a focus on preserving natural resources and safe disposal of harmful products has fallen in step with the fast-tracked effort to restore Iraq.

One USACE job is to make sure we leave the environment in no worse condition than it was found. Environmental specialists are assigned to all military sites throughout the country to ensure that military operations do not adversely affect the areas. Realistically, Iraq is still a war zone, but we still have a responsibility to do the right thing.

Environmental assessments are also done to protect the troops in the field. Environmental specialists at forward operating bases attempt to determine if

air, soil, and water are free of pesticides, chemicals, smoke, and bacteria that would harm those serving in the area.

When inspecting a temporary landfill in the Green Zone, where Iraqi government offices and US forces are based in Baghdad, environmental specialists ensure that only approved construction debris is being dumped (see photo above). The site, located adjacent to the Tigris River, is not ideal, but it serves immediate needs for the rebuilding effort. Once hostilities settle down to a point that an external site can facilitate disposal of construction debris from the Green Zone construction, then this area will be cleaned back to the open field it once was.

Environmental specialists also manage and develop procedures to properly dispose of hazardous materials. Drums of chlorine wash are stockpiled until they can be properly disposed of. In other areas, reuse of hazardous materials has helped minimize the impacts of multinational force operations.

For example, oil waste from operations is being used as a burn product for some of the electrical generation projects in country.

Simply because a combat environment is not conducive to typical environmentally conscious activities doesn't mean the military or coalition can turn a blind eye to it. Not only is the multinational force not turning a blind eye, it is investing substantially so the efforts here to liberate the country don't leave its environment unnecessarily scarred.

When not in the field performing project oversight, environmental specialists are combing through baseline assessments of operations throughout Iraq, identifying potential environmental concerns and impacts—impacts the multinational force will one day return to assess and, in some cases, remediate or clean up.

In addition to monitoring the efforts of the multinational force, USACE environmental specialists also work with



Photo by Thomas O'Hara III

This landfill on the banks of the Tigris River is a temporary solution to handle construction debris. Local Iraqi workers manage the disposal of the debris.

the newly established Ministry of the Environment to develop new policies in Iraq to minimize the damages that occurred prior to Iraq's liberation. There was a lot of environmental damage during the 30 years of oppression under Saddam Hussein, but Iraq can recover. Containment for spillage of oil operations, protection of water resources to minimize the spread of disease, as well as advancements in industrial waste monitoring will eventually help the country's 25 million people enjoy a healthier society.

Iraq is a beautiful country, and its history is significant for all cultures—not just the Iraqis. We must make sure it is preserved for all to enjoy.



Mr. O'Hara is serving in Iraq as Deputy Chief of Public Affairs for the Gulf Region Division. Stateside, he is the Deputy Chief of Public Affairs for the Omaha District, US Army Corps of Engineers. He holds a bachelor's in electrical engineering.



Pollution Prevention Improves Air Quality at Fort Campbell

By Ms. Crystal Longdon

Sound environmental practices are part of what a soldier does and part of daily operations on a military installation. That means that every day is Earth Day for the Army. At Fort Campbell, Kentucky, personnel from the Directorate of Public Works Environmental Division's Air Quality Program work with the installation's everyday "air quality heroes" to continuously protect and improve air quality and to meet the standards set by state, federal, and Army regulations. Fort Campbell's everyday air quality heroes include the personnel who work on a daily basis with various air contaminant sources, such as large boilers and fuel burning equipment, spray paint operations, above- and underground storage tanks, the dry cleaning facility, roads and grounds operations, parts washers and degreasers, and refrigerant units.

Air Quality Program personnel work closely with the management and personnel of these operations to ensure that regulatory requirements are always met, workers are properly trained in air quality requirements, and ideas for reducing the sources of air pollutants are developed further and implemented when feasible. That's where pollution prevention comes in. The program personnel are continually looking for ways to reduce air pollutants at their source, rather than waiting to treat and capture pollutants once they are emitted. Pollution prevention projects are designed to reduce air contaminants and stratospheric ozone depleting compounds. Air Quality Program personnel are currently pursuing nine pollution prevention projects, with the goal of continuing to reduce total air contaminant emissions each year.

One of Fort Campbell's most successful ongoing pollution prevention projects was undertaken by the spray paint operations. This project replaces traditional solvent-based coatings with water-based coatings, which are much less hazardous. These specialty coatings, known as chemical agent resistant coatings (CARC), are used for the repair coating of military vehicles and aircraft. The use of water-based CARC has already been approved for most military applications of these specialty coatings, and work is underway to gain approval for the application of compatible water-based CARC to military aircraft.

Fort Campbell began using the water-based CARC on its tactical vehicles in 2001 and has since increased its usage every year. Use of the new paint results in a significant reduction of air contaminants. In 2003, implementation of the project reduced the volatile organic compound and hazardous air pollutant emissions from the painting operations by 48 and 52 percent, respectively. Volatile organic compounds contribute to the formation of unwanted ground-level ozone. Hazardous air pollutants are substances known or suspected of causing



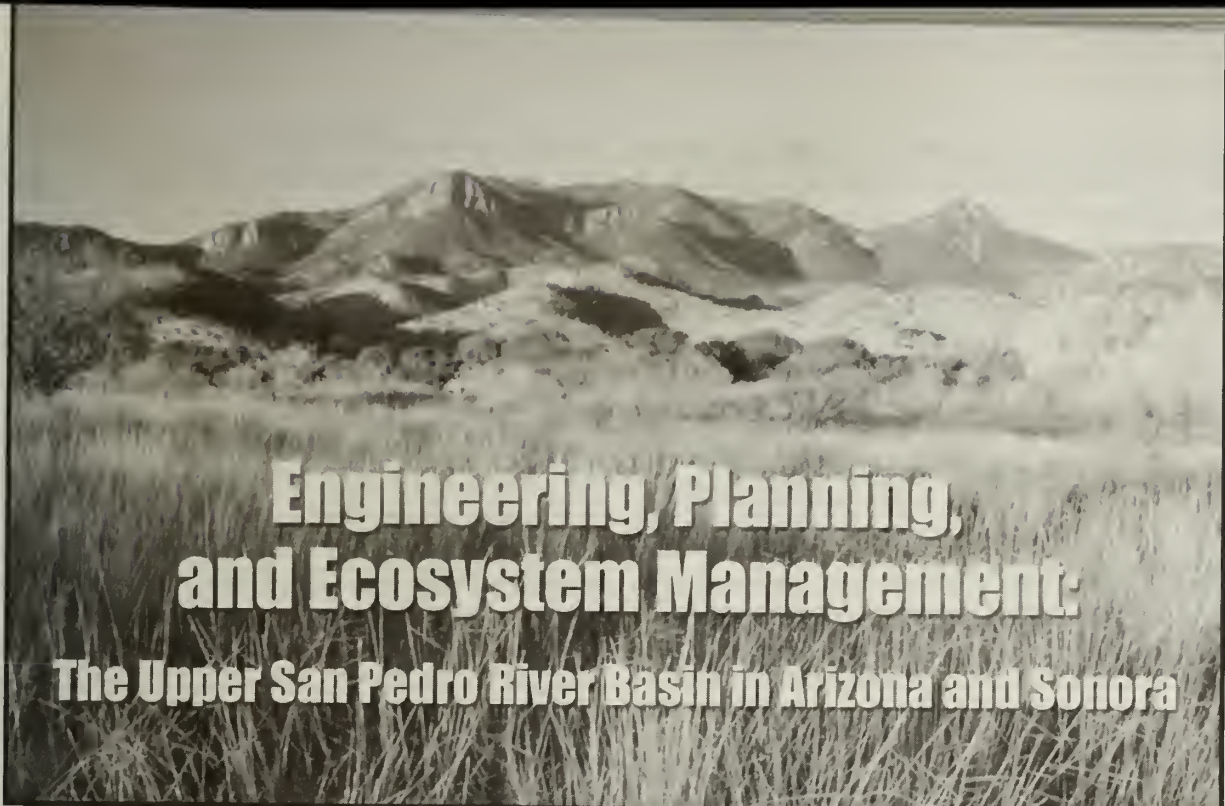
The use of water-based chemical agent resistant coatings has greatly reduced volatile organic compound and hazardous air pollutant emissions on Fort Campbell.

adverse health and environmental effects. Pollution prevention projects, such as the switch to water-based coatings, not only benefit the environment but often also improve worker safety. In this case, both the workers and the environment are now exposed to fewer air contaminants, and the material wastes that are produced are less hazardous.

However, pollution prevention does require operational changes. In the case of the spray paint operators, there's been great success with the changeover—that's why we call them air quality heroes. The people who are directly responsible for the work are the key to project success and often play the greatest role in protecting our environment. They're our first line of defense.

The painters are proud of the program's accomplishments and their contributions to its success. They are now gearing up for the return of about 13,000 pieces of equipment (tactical vehicles), all of which will be spray painted with the new water-based CARC.

Ms. Longdon, of XCEL Engineering, Inc., is a senior environmental scientist working under contract to support the Air Quality Program of the Fort Campbell Directorate of Public Works Environmental Division. She has more than 16 years of experience in the areas of environmental compliance, waste management, health and safety, and remediation. Her past experience also includes work at a Naval fuels production facility and several US Department of Energy facilities.



Engineering, Planning, and Ecosystem Management

The Upper San Pedro River Basin in Arizona and Sonora

Photo by Robert L. Anderson

By Mr. Robert L. Anderson

The Upper San Pedro River Basin in southeastern Arizona is home to both Fort Huachuca—the Army's Intelligence Center and Electronic Proving Ground—and the growing city of Sierra Vista. The basin also contains some of the most diverse plant and animal life in North America. However, water use by Fort Huachuca, Sierra Vista, and agriculture in the basin threatens to lower the water table and dry the San Pedro River. This, in turn, could alter the vegetation in the basin and eliminate endangered species habitat in the nation's first federally protected riparian National Conservation Area. A team from the Harvard Design School; the University of Arizona; the Desert Research Institute; Headquarters, US Army Training and Doctrine Command; and the US Army Corps of Engineers determined the range of potential future growth patterns for the basin (Alternative Futures) and compared them for their relative impacts on a suite of environmental parameters, including hydrology, biodiversity, and landscape vegetation pattern.

Environmental Setting

Originating just south of the Mexican border, the San Pedro River flows northward, through the high desert of southeastern Arizona. Ecologists call the area a *transition zone*; it is an area with great biodiversity, where the species of four ecoregions overlap. From the north, the Rocky Mountains merge their Canadian and temperate character with the subtropical influences of the Sierra Madres. From the west, the Sonoran Desert, with its giant saguaro cactus, blends to the south and east with the Chihuahuan Desert, dominated by creosote bush. A multitude of ecological niches, created by variations in altitude and microclimates in the isolated

mountains that rise like islands from a desert sea, expands the diversity.

Walking through the Huachuca Mountains on the fort at sunrise, one might spot a group of coatis, which resemble a hybrid between a raccoon and a monkey; piglike collared peccaries; a mountain lion; dozens of butterfly species; and scores of the nearly 400 bird species reported in the basin, including the quetzallike elegant trogon. Even jaguars have been reported near Fort Huachuca. The wildlife is similar to that found in a Central American forest.

The vegetation changes from high desert grassland and scattered mesquite near the valley floor to a Madrean montane conifer zone at the highest elevations, where Douglas and other species of firs, ponderosa pines, and aspens dominate. Nearly 1,000 plant species have been identified in the Huachuca Mountains alone.

The Problem

Environmental debate is a standard part of public discourse in the valley, which has been a center of controversy for well over a decade. Litigation and public debate have ensued over whether groundwater use from Fort Huachuca, an expanding Sierra Vista population, and valley agriculture will dry up the last free-flowing river of the southwestern deserts. A drive through Tucson or Phoenix reveals dry ghosts of former rivers, now containing water only during monsoon cloudbursts. Without concerted effort, the San Pedro River could suffer the same fate. The Sierra Vista newspaper, the *Herald*, has stated that the city looks to the Army for leadership in environmental issues.

Unfortunately, our ability to alter ecosystems far outpaces our ability to understand and manage them. The science of ecology, established in 1859, is a relatively young science, with no agreement on a standard approach to ecosystem management. However, it is evident that any such approach will need to center first on understanding and then compensating for how humans adversely impact the biological and chemical cycles that support the multiplicity of organisms—including people—in an ecosystem. Humans change the environment through land clearing, paving, development, agriculture, etc., in ways that can alter the ecosystem to a point where ecological sustainability is lost. Watersheds seem to be the best method of parsing an ecosystem into manageable units.

Engineering Solutions

Engineering efforts that have already been undertaken to conserve water at Fort Huachuca include closure/demolition of unused facilities, waterless urinals, low-flow fixtures, rainwater harvesting, leak detection, replacement of evaporative coolers with air-conditioning, xeric landscaping (use of native vegetation requiring little water), and irrigation with effluent. These efforts have resulted in reducing water use at the fort by nearly half since 1993—a remarkable accomplishment.

However, it is difficult to achieve equilibrium between groundwater pumping and recharge in arid environments. Although importing water is one option, a better option is to compensate for evaporative loss by supplementing effluent recharge with captured mountain-front runoff.

Stimulated by concern for the fort and the need for a regional, multidisciplinary approach, the Upper San Pedro Partnership (USPP)—a consortium of 21 state, federal, and local governments and private nonprofit and commercial members—was created in 1999. The goal of the USPP is to balance regional water use with recharge to sustain human needs, the river, and the National Conservation Area. As a member, the fort is working with the USPP to add 250 acre-feet of storm water to approximately 1,000 acre-feet of treated effluent recharge annually.

A New Challenge

Pursuant to a 2002 US Fish and Wildlife Service Biological Opinion issued under the Endangered Species Act, Fort Huachuca is obligated to balance its groundwater uptake with recharge by 2011. The Biological Opinion determined the Fort Huachuca responsibility to be 2,784 acre-feet per year, or 54 percent of the annual basin deficit (the difference between amounts pumped from and recharged to the aquifer) of 5,144 acre-feet. The city of Sierra Vista proposes to eventually recharge 3,600 acre-feet of treated effluent and storm water annually, allowing a cushion for fort mission expansion, if needed. The question is whether the region—not just the fort—can *reach* and *sustain* equilibrium between

pumping and recharge while continuing to grow. This is as much an engineering challenge as an ecological one; therefore, civil engineers and hydrologists will play a major role.

Ecological Planning

It is often difficult for planners to foresee long-term, cumulative ecological impacts resulting from their decisions. This is due, in part, to the gradual nature of growth and the general inclination of planners to focus on parcels rather than on the entire regional landscape. The region's problems are indeed greater than the sum of its parcels.

Regarding these problems, the work of Carl Steinitz (the Alexander and Victoria Wiley Professor of Landscape Architecture and Planning at Harvard Design School) is impressive. He has developed a planning approach which he calls *Alternative Futures*. By surveying local stakeholders, his research team determines the range of potential growth patterns that might occur in an area over the next 20 years. The three initial alternatives considered include current growth plans; a constrained alternative, projecting less growth than anticipated; and an open alternative, projecting greater growth than anticipated. Each alternative is then analyzed by Geographic Information System models for its impacts on a range of environmental factors. In addition, the following questions are posed during the course of an Alternative Futures analysis:

- How should the landscape be described in content, space, and time?
- How does the landscape operate? What are the functional and structural relationships among its elements?
- Is the current landscape working well ecologically and culturally?
- How might the landscape change? By what policies and actions might it change? Where and when might it change?
- What differences will the changes cause?
- How *should* the landscape be changed?

Notice that if the questions are asked in reverse order, they provide a framework for evaluating whether pending planning decisions make sense. In the course of an Alternative Futures study, the questions are asked three times—each time reversing the previous order. Using this approach, planners have a much clearer vision of the potential for adverse environmental impacts in the future. It may even become apparent that some desirable future scenarios—such as maintaining river habitat—may not be attainable once certain thresholds—such as lowering the water table—are crossed.

The San Pedro Study

To represent the dynamic processes at work in the study area, a Geographic Information System was used to organize spatially explicit data for the region. The data was based on conditions in the study area during the period

from 1997 to 2000 (baseline 2000), which defines the reference period against which impacts of future changes were measured.

After questioning developers, a development model was derived to evaluate the attractiveness of available land for five kinds of development: commercial, urban, suburban, exurban (between suburban and rural), and rural housing. This model simulated the urbanization of the region under the three basic Alternative Futures scenarios. In addition, the study also examined two or three variations of each of the three basic scenarios in order to thoroughly investigate the full range of Alternative Futures the region might experience. To help generate the scenarios, questionnaires were developed for local citizens based on three issues that are central to public debate in the region: development, water use, and land management. The responses, interpreted into a set of assumptions and choices about policy, served as the basis for the range of future scenarios. All scenarios were projected to 2020 via the development model. One example of a scenario variable included maintaining the fort at current strength, expanding it, or closing it. However, none of the scenarios considered the impact of treated effluent and storm water recharge projects now proposed by the city and fort; follow-up evaluations will be needed once these projects have been finalized. Once the scenarios were developed, they were linked to a suite of process models to describe and evaluate how certain aspects of the landscape would be affected under each alternative.

The environmental factors analyzed in this study—each impacting subsequent factors in a cascading series—included hydrology, soil moisture, vegetation pattern, landscape ecological pattern, fire ecology, several endangered species habitats, and overall biodiversity. In addition, variations were analyzed in the view shed (scenic value) for each scenario. For example, a hydrological model evaluated how changes in groundwater storage affect surface flow in the river. A vegetation model indicated how changes in the hydrologic regime could subsequently impact fire and grazing management practices. Predictions of new vegetation patterns then formed the basis for a three-part assessment of regional biodiversity: a landscape ecological pattern model, an endangered species habitat model, and a vertebrate species richness model. The models were used to assess the potential impacts of each of the scenarios relative to the 2000 baseline conditions.

The San Pedro study occurred between 1997 and 2000 and is the first Alternative Futures study Steinitz has published as a book: *Alternative Futures for Changing Landscapes: The Upper San Pedro River Basin in Arizona and Sonora*. Island Press, 2003 (800.828.1302). This was also the first time an Alternative Futures study was conducted for an Army installation.

Results of the Study

The results of the study help determine how the region's activities can influence its natural resources and what can be done to mitigate negative impacts. For example,

the study determined that basin agriculture was a major use of groundwater. To compensate for this, the fort, in cooperation with The Nature Conservancy, became the first installation to purchase off-post conservation easements for water rights from willing sellers near the river. This will eliminate 1,930 acre-feet per year of withdrawal near the river—a significant step toward sustainability.

The study seems to have ended the debate about whether the river is threatened. The baseflow of the river was lowered in all but the most conservative growth scenarios; again, proposed recharge was not evaluated. This stimulated the concerted regional effort of the USPP with its goals to protect human needs, the river, and the fort. However, Sierra Vista remains attractive to retirees and others seeking high desert scenery and escape from lower elevation heat. This is perhaps one of the best test cases in the nation for balancing growth and ecosystem sustainability.

Acknowledgments: The author is grateful to the Department of Defense Legacy Resources Management Program for funding the study.



Mr. Anderson is an environmental and natural resources specialist in the Engineer Directorate at Headquarters, Training and Doctrine Command, Fort Monroe, Virginia. He holds a bachelor's in biology from Old Dominion University and a master's in biology from the College of William and Mary.

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PHYTOREMEDIATION SYSTEM CLEANS UP GROUNDWATER PLUME

By Mr. John Wrobel

The Department of Safety, Health, and the Environment at Aberdeen Proving Ground (APG), Maryland, joined with the US Environmental Protection Agency (EPA) almost 8 years ago to implement an innovative solution to remediating an area of groundwater contamination. In 1996, APG and EPA began a pilot-scale phytoremediation study at the J-Field area of APG to evaluate the capability of hybrid poplar trees to reduce a volatile organic compound (VOC) groundwater plume. Eventually implemented as part of the legal remedial alternative for the site, the phytoremediation system has proven to be an effective, low-cost solution to groundwater contamination.

Background

Between 1940 and the 1970s, the Army used J-Field for testing and disposal of chemical weapons and chemical warfare materials. Environmental studies indicated high levels of a variety of VOCs in the groundwater. The two primary contaminants are trichloroethylene (TCE) and 1,1,2,2-tetrachloroethane. Several conventional remedial technologies were studied or tested during the remedial investigation/feasibility studies, including soil washing, soil vapor extraction, pump and treat, and groundwater circulation wells, as well as in situ biotic and abiotic degradation processes. However, there are several unique aspects of the J-Field area that significantly hinder the use of conventional technologies. For example, because of historic testing and disposal activities, there is a potential that unexploded ordnance (UXO) may be present. In addition, there is a low-permeability aquifer and a

persistent VOC source consisting of dense non-aqueous-phase liquids. During evaluation of remedial alternatives, APG became aware of the work of the EPA Environmental Response Team in the area of phytoremediation. EPA had been testing hybrid poplar trees to see if they could be used to remediate groundwater containing TCE. APG and EPA subsequently began collaboration on a phytoremediation system for J-Field.

Methods

In 1996, a test plot of 183 hybrid poplar trees was planted to evaluate whether the VOCs in the groundwater could be naturally removed and/or destroyed by the trees or their associated microorganisms. The trees were planted 5 to 8 feet deep—almost four times the normal depth—to give the roots an opportunity to effectively filter the groundwater. The trees were arranged in a U-shaped configuration around a former disposal area. The success of the test plot led the Army and EPA to sign a Record of Decision selecting phytoremediation as part of the remedy for the groundwater at J-Field.

By 1998, several trees had died because of the stress induced by a drought, and replacement trees were planted the following year. The replacement trees consisted of hybrid poplars, tulip trees, and silver maples—species native to APG. Using a variety of native tree species reduces the grove's susceptibility to mass wasting—an inherent weakness of monocultures. This approach is consistent with Executive Order 13112, *Invasive Species*, which directs federal agencies to restore disturbed sites with native species.



Workers prepare an area of the J-Field phytoremediation grove for the planting of additional trees.

Also during 1998, several of the original trees were excavated so that the impacts of plastic sleeves, which had been placed around the tree roots prior to planting, could be examined. It had been theorized that use of the sleeves might encourage downward root growth and groundwater uptake. However, it was found that the sleeves, coupled with the high clay content of the soil, restricted downward root growth. Lateral and surface root growth was also restricted, which caused many of the trees to blow over during a tropical storm. Based on these results, use of the sleeves was discontinued during the second round of planting. Root growth patterns were also examined, and boreholes of various diameters and depths were used in the second round of planting to encourage more extensive root growth. It was discovered that, when planting trees in tight soil formations, it is

important to score, aerate, or otherwise loosen the soils surrounding the borehole to allow for optimal root growth and development and to maximize transpiration rates.

Results

A comprehensive monitoring, sampling, and modeling program has been used to evaluate the effectiveness of the grove. Growth rates of tree roots have been monitored, and transpiration rates have been estimated to evaluate the potential rate of contaminant removal. In addition, a groundwater monitoring program has been implemented to monitor groundwater chemistry and to define the capability of the trees to provide hydraulic containment. The roots of the trees have been observed to grow up to an inch per day, and the grove has been found to absorb about 30,000 gallons of water per day during the summer growing season. The trees are functioning as a natural pump-and-treat system.

A 2002 study conducted by APG examined contaminant uptake by the trees. The detection of VOCs and their degradation products in transpiration gas, condensate, and leaf tissue indicated that the trees were removing and degrading the contaminants of concern. It was estimated that the trees had destroyed up to 60 pounds of solvents and had contributed to additional contaminant destruction by promoting biological activity in the shallow aquifer. APG

estimates that site contamination may be reduced by up to 85 percent in 30 years. This natural pump-and-treat system is also reducing cleanup costs. Systems typically used to remediate such sites could cost an estimated \$5 million to build and an additional \$100,000 per year to operate; the phytoremediation effort is expected to cost significantly less.

In 2004, the Maryland Department of Natural Resources Forest Service presented APG with the Green Award—the highest-level award an organization can attain in the program—for the use of phytoremediation at J-Field. The award recognizes APG's successful program and sustained effort in utilizing phyto-technologies for the benefit of the environment.

Various organizations and groups—such as the APG Restoration Advisory Board, the Federal Facilities Leadership Council, foreign dignitaries, and university personnel—frequently tour APG's J-Field phytoremediation area. 

Mr. Wrobel works in the Environmental Restoration and Conservation Division at APG, where he has been responsible for installationwide implementation of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) projects since 1987. He holds a bachelor's from Norwich University and a master's in engineering from the University of Lowell.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since the last issue of *Engineer*. We dedicate this issue to them.

Sergeant First Class Joselito Villanueva	9th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Sergeant Michael Boatright	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Sergeant James Faulkner	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Specialist Jaime Moreno	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Captain Dennis Pintor	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Specialist Michael Wegar	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Private First Class Mark Barbet	44th Engineer Battalion	Camp Howze, Korea
Staff Sergeant Omer Hawkins	44th Engineer Battalion	Camp Howze, Korea
Private First Class Aaron Rusin	44th Engineer Battalion	Camp Howze, Korea
Specialist Oliver Unruh	44th Engineer Battalion	Camp Howze, Korea
Private First Class Andrew Ward	44th Engineer Battalion	Camp Howze, Korea
Sergeant Arthur Williams	44th Engineer Battalion	Camp Howze, Korea
Specialist David Mahlenbrock	65th Engineer Battalion, 25th Infantry Division	Schofield Barracks, Hawaii
Sergeant Charles Webb	82d Engineer Battalion, 1st Infantry Division	Bamberg, Germany
Specialist Clarence Adams	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Staff Sergeant Lance Koenig	141st Engineer Battalion	Jamestown, North Dakota
Specialist Cody Wentz	141st Engineer Battalion	Williston, North Dakota
Sergeant Catalin Dima	411th Engineer Brigade	New Windsor, New York
Staff Sergeant Michael Ottolini	579th Engineer Battalion	Petaluma, California



Environmental Lessons Learned for the Engineer Regiment



Engineers are expected by maneuver commanders to be ready to address and work the full gamut and all aspects of combat and construction engineering. Engineers are being called on to handle environmental issues and threats in support of mission objectives. Engineer commanders must be prepared to conduct missions associated with site assessment for environmental baseline surveys (EBSs), environmental risk analysis, waste management and mitigation, remediation and cleanup, dust suppression, and support requests for assistance from civilian authorities.

Engineer officers, regardless of their rank or background, must be adequately prepared for construction and environmental tasks in theater. The two disciplines compliment one another. When the maneuver commander needs construction expertise, he expects his engineers to provide it—whether or not they have spent their entire career working combined arms or combat engineering. The following is a list of subjects that engineer officers need to know, or they need to know where to find the information. These were identified during Operations Desert Shield and Desert Storm in Iraq, Operation Joint Endeavor in the Balkans, and specifically mentioned in a Memorandum for Record from the Combined Forces Land Component Command Staff Engineer Section Forward (CLFCC-C7 FWD) Plans and Operations.

- Functions and capabilities of departments of the US Army Corps of Engineers (USACE), as well as differences in division/district offices.
- Facility Engineer Team (FET) capabilities.
- Organization of regional contracting commands and what they provide.
- Multinational Forces-Iraq (MNF1), Multinational Coalition-Iraq (MNCI), Coalition Forces Command-Afghanistan (CFC-A), Combined Joint Task Force-76 (CJTF-76)—who they are and what they do.
- Knowledge of where funding is available, how to justify a project, what level of command approves project funding (for example, corps commanders can approve projects of \$750K or less), how legal reviews work, and what a DD 1391, *Military Construction Project Data*, is and how it works.
- Standards for detainee facilities.
- The role of civil affairs in construction; how civil repair projects work.

- Captains and lieutenants must have a knowledge of strategic-level planning (“awareness”); for example, know how we influence the information operations campaign with construction capabilities.
- Capabilities of sister services.
- Master planning for base camps.
- Environmental planning for base camps.

Specifically, in the environmental arena, environmental management in theater cannot be a neglected engineer function. Battalions have to implement environmental programs and plans for conducting EBSs prior to units occupying sites, perform compliance inspections and closure reports, and know whether these reports are being properly completed. The importance of conducting an initial EBS to verify conditions at the outset of operations cannot be overstated. An EBS needs to be conducted in conjunction with an Army unit occupying a location for any extended period of time. This will ensure that the site is safe for soldiers to occupy, and it will validate the conditions at the time of the occupation. This will save the government from being “held hostage” by these countries once the nation-building piece (often known as Phase IV) is complete. Millions of dollars in the future can be saved if we, as engineers, take the proper steps now to maintain compliance. Engineers must understand the legal ramifications of environmental issues. As units in theater begin to consolidate into fewer, larger forward operating bases (FOB), complete FOB closure will become a large issue with the host nation countries. Consistent closure standards must be clearly understood by all Army units to avoid disputes when it comes time to close a base camp or FOB.

In addition to the above-mentioned issues, the following lessons have also been observed as part of our contingency operations.

Geographic Information Systems can be a significant tool to help engineers support base camp master planning, construction design, and environmental planning. This capability is usually only found in the engineer topographic companies or terrain teams and must be made readily available for other supporting engineer functions.

Maneuver commanders need to realize that environmental stewardship is equal to force protection. Improper storage or disposal of hazardous and solid waste can pose as much of a risk to soldier health and safety as regular operations.

Resources for environmental management must be prioritized accordingly. The environment into which our soldiers have been deployed is rife with environmental hazards. Contamination of the soil and water is common, and hazards such as asbestos, PCBs from electrical transformers, and unidentified drums of chemicals present challenges to the health and well-being of our troops. While not immediate, the health effects from exposure may have long-term implications on soldier health.

Hazardous waste (HAZWASTE) storage is a significant issue. Units must prepare field storage facilities early to accommodate huge volumes of HAZWASTE—primarily for petroleum, oil, and lubricants (POL) and batteries—until proper disposal can be arranged. In many cases, units will be required to set up base camps where significant waste issues already

exist. Prior planning and evaluation is essential to ensure the safety of the force. Colocating solid waste and HAZWASTE disposal facilities and recycling areas will make disposal easier, allowing greater compliance by soldiers and units.

Poorly constructed and located solid waste burn pits create an unacceptable hazard to soldiers. During initial base camp development, burn pits should—

- Be large enough to ensure standoff from burning debris.
- Have controlled access to prevent unauthorized burning.
- Be located downwind of life support areas to reduce exposure to smoke.

As camps develop, other disposal methods—such as on-site incinerators or contract hauling and disposal—should be implemented.

The US Army Engineer School (USAES) is the Army's proponent for environmental integration across the domains of doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF). The Directorate of Environmental Integration (DEI) performs this mission for USAES on a daily basis. DEI has doctrine, environmental, and training development professionals, as well as an engineer and support staff to accomplish this mission. DEI canvassed the Army community for the feature articles in this issue of *Engineer* and appreciates the input and sharing of information for the Engineer Regiment. For further information on DEI, go to their Web site at <http://www.wood.army.mil/dei>.

The Engineer Writer's Guide

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in PowerPoint. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of

your past assignments, experience, and education; your mailing address; and a fax number and commercial day-time telephone number.

Include a statement with your article from your local security office that the information contained in the article is unclassified, nonsensitive, and releasable to the public. Not only is *Engineer* distributed to military units worldwide, it is also available for sale by the Government Printing Office.

We cannot guarantee that we will publish all submitted articles. They are accepted for publication only after thorough review. If we plan to use your article in an upcoming issue, we will notify you. Therefore it is important to keep us informed of changes in your e-mail address or telephone number. All articles accepted for publication are subject to grammatical and structural changes as well as editing for style.

Send submissions by e-mail to engineer@wood.army.mil or send a 3 1/2-inch disk in Microsoft Word, along with a double-spaced copy of the manuscript, to: Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 348, Fort Leonard Wood, Missouri 65473-8929.

Note: Please indicate if your manuscript is being considered for publication elsewhere. Due to the limited space per issue, we seldom print articles that have been accepted for publication by other Army professional bulletins.



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While at War!



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Clear The Way

By Major General Randal R. Castro
Commandant, US Army Engineer School



Greetings from Fort Leonard Wood, home of the Engineer Regiment! I want to personally thank all of you for your steadfast and honorable service to our Nation. Right now, across the world, engineer Soldiers are serving with great distinction. With our unwavering efforts in the war against terror, our support to disaster relief, and our rapidly transforming Army, it is clear that the Regiment will be needed even more in the future. Here at the Engineer School, we have made steady progress in a number of areas to Train, Transform, and Take Care of our Regiment. Our updated mission and vision statements, as well as a more comprehensive letter to the Regiment, are posted on the Engineer School Web site. Our focus is on providing the skills and tools the Regiment needs to Support the War, Conduct Initial Military Training and Leader Development, and Transform our Regiment. I'll highlight some of our initiatives in these areas.

To **Support the War**, we have deployed a variety of **Mobile Training Teams**. They provided instruction on subjects from equipment to leader training. If you identify a need for a mobile training team, contact us so we can ensure that units preparing for operations know what information, products, and training are available to make their preparation as current as possible. We also represent the engineer perspective in the Army's continuous **Doctrine, Organization, Training, Materiel, Leader Development, Personnel, and Facilities (DOTMLPF) Gap Analysis**. We have conducted or participated in DOTMLPF analysis for improvised explosive device (IED) defeat, the Army's counter rocket artillery and mortar effort, geospatial systems, construction equipment, and gap crossing capabilities. Our focus is on ensuring a thoroughly integrated assured mobility concept, leading the Army team in IED defeat, developing and implementing a strategic construction equipment acquisition approach, implementing and assessing the reorganization of the Regiment, and completely analyzing all aspects of the sapper as the expert in urban and complex terrain.

The most recent change to **Initial Military Training** is the implementation of **Warrior Tasks and Drills**. A major effort was placed on getting skilled junior engineer Soldiers and leaders with an even stronger Warrior Ethos into their first unit. You should see Soldiers coming into your formations with enhanced, more in-depth training in the proven fundamentals of shoot, move, communicate, and survive.

For our new lieutenants' **Training and Leader Development**, we have implemented the **Small-Group Instructor** program in our Engineer Officer Basic Course (EOBC) with



seasoned first lieutenants (P)/captains staying after graduation from the Engineer Command and Staff Course (ECSC) to teach and lead junior lieutenants in a small-group setting. Our emphasis continues to be on teaching crucial engineer skills to junior leaders—but through the lens of current operations. The multifaceted, maneuver-oriented skills of the engineer officer have served us well and serve as a model for the Chief of Staff's vision of a future Army leader: a decathlete with a broad understanding of operations, armed with in-depth skills to support the Joint Warfighter. Our goal is digitization of the School's environment so it is comparable to our digitized units in the field, with greater emphasis on the use of digital tools—from geospatial to battle command.

We added recent lessons learned and fundamental observations from current operations to our **Engineer NCO Training**. We removed common core from the Advanced Noncommissioned Officers Course (ANCOC) to allow more time to teach relevant critical skills to our sergeants first class, while the Basic Noncommissioned Officers Course (BNCOC) replaced 43 hours of new material to stand-alone common core. I request your emphasis in sending your NCOs to these courses. While attendance at ANCOC has been at 95 percent in FY04, attendance at BNCOC was only 65 percent. As leaders, we must show our commitment to developing our NCOs by letting them attend these critical schools at the earliest opportunity in their careers. I ask for your commitment to send your soldiers to school.

We have added more than 15 courses to teach **Specialty Skills for our Engineer Soldiers and Leaders**. We partnered with the Marine Corps to train Soldiers at the Urban Mobility Breaching Course, at Camp LeJeune, North Carolina. The School also led the Army's effort in search dog training—a skill which is highly sought by maneuver commanders. We have added an Explosive Ordnance Clearance Agent (EOCA) Course to the specialty skills available for training. The pilot Unit Search and Unit Search Advisor Courses took off successfully, training 46 searchers and 23 search advisors. The courses span in-person, vehicle checkpoint, survey, route, occupied and unoccupied building, and elements of venue searches (Urban Engineer Scout Operations). We also fence 15 Sapper Leader Course slots per EOBC to ensure that lieutenants arrive at their first unit of assignment as well-trained as possible. Continue to request slots so we can show the Army our need to grow even more.

(Continued on page 6)

Lead The Way

By Command Sergeant Major Clinton J. Pearson
US Army Engineer School



Greetings to all! Our Regiment is steadily growing, and we have been constantly assessing its T3s (Transform the Regiment, Train Soldiers and Leaders, and Take Care of the Regiment) to meet our ever-changing environment. The Regiment is changing daily, with the implementation of the new Future Engineer Force structure. A few of these new incentives are the Urban Mobility Breaching Course (UMBC), Explosive Ordnance Clearance Agent (EOCA) Course, Counter Explosive Hazards Center (CEHC), military occupational specialty (MOS) consolidations, and initial-entry training (IET).



The UMBC has been a big success. The first course, from 4 to 26 October 2004, graduated 15 noncommissioned officers (NCOs). The course now has three qualified Army instructors who will augment the United States Marine Corps instructors. The second class was from 31 January to 18 February 2005. The 120-hour program of instruction (POI) consists of in-depth explosives theory; employment of urban breaching techniques, including explosive, manual, and ballistic breaching; urban reconnaissance; lethal and nonlethal methods of entry; and the use of shotguns. This course has greatly improved the sapper's ability to fight and win in an urban environment. It is receiving terrific support from the field, and class seats fill as soon as slots are available.

The EOCA Course was established to help close the gap between EOD and engineers. The course is designed to train E-4 and E-5 promotables and selected engineer lieutenants to captains. This course teaches how to manage unexploded ordnance (UXO) information, positively identify ordnance, identify fuse types, perform reconnaissance on UXO, implement protective measures, and determine disposition of UXO. The 16-week course (taught at Redstone Arsenal, Alabama) provides the basic skills and knowledge required to perform as EOCA's. Additional information can be found at the US Army Engineer School home page.

A good news story is also found in the CEHC. It continues to work with numerous external agencies—including the Rapid Equipping Force (REF) and the Joint Improvised Explosive Device Defeat (JIEDD) Task Force (TF)—to develop and field innovative counter-improvised explosive device (IED) solutions. To accommodate all the training that is evolving as a result of its efforts, the CEHC will develop a state-of-the-art training center to be completed in 2006. Engineer School efforts have gained congressional support, resulting in the recent appropriation of \$10.4 million for a Counter Explosive Hazards Center of Excellence and an added \$3.7 million for

mine dog kennels, with construction to begin in fiscal year 2005. This is Phase One of a two-part \$18-million construction effort to establish a permanent counter explosive hazards training complex. This will provide specialized training areas and classrooms, search villages, a motor park for nonstandard counter-IED/mine equipment, and permanent mine dog facilities. It will also have adequate space for route and area clearance in order to enhance the overall realism of the training. Additionally, all operator and maintainer training for nonstandard counter-explosive equipment will be taught at this facility until it is institutionalized throughout the force. All the activities will

be colocated in an area on Fort Leonard Wood that will provide better fusion and integration of the CEHC, the Humanitarian Demining Training Center, the 67th Engineer Detachment (Mine Dog), and possibly a Department of Defense mine dog training academy, forming an Explosive Hazards Center of Excellence.

MOS consolidations include combining the 21U topographic analyst and 21L lithographer, with an additional skill identifier (ASI) being awarded to designated personnel qualified as lithographers. The 21T technical engineer specialist and 21S geodetic surveyor will consolidate, resulting in the deletion of 21Ss and creating a 21T multifunctional surveyor. The 21F crane operator and 21J general construction equipment operator will consolidate in fiscal year 2006, resulting in an MOS 21J general construction equipment operator. Finally, combining MOS 21J with the 21E heavy construction equipment operator is being considered, possibly creating a 21E construction equipment operator.

As a part of IET transformation, training developers are converting Common Engineer Training (CET) to Battle-Focused Training (BFT), by incorporating the Warrior Tasks and Drills (WT&D) into the IET POI. Another project involves extensive efforts toward IED defeat. We are also working on producing Mission Training Plans (MTPs) to support Future Engineer Force (FEF) units to include development of collective training for maneuver enhancement (ME) brigades. This process allows us to train Soldiers, not a unit, for war.

If war is the norm and peace is the exception, your Regiment is leading the way. We are training our Soldiers for war now. We continue to focus our efforts on the 3Ts, maintaining high standards and leading the way as engineers have always done. May God bless our fallen comrades, keep their families in the palm of His hand, and keep watch over our sons and daughters as we continue to fight the fight. Essayons!



DEVELOPING THE RIGHT SKILLS AND TOOLS— AS A TEAM!

By Major General Randal R. Castro and Lieutenant Colonel Paul L. Grosskruger

Throughout its history, the Engineer Regiment has distinguished itself, time and time again, by its support to our Nation. And at this point in our history, we stand together at a crossroads of relevance. We must select the right fork in the road—that which takes us toward developing relevant skills and tools for our units and staffs. We must quickly address capability gaps in urban and complex terrain. We must ask ourselves, “Do we have the tools we need?” “Are we skilled to accomplish the tasks required?” “Do we have the right organizations?” It is up to us to seize the initiative and make this happen!

Challenges and Opportunities

Today’s landscape is changing by the minute. It’s filled with quickly evolving technologies, instantaneous global communication, and increasingly complex urban population centers and terrain—together with highly adaptive, deadly, motivated, and elusive enemies who play by their own rules. In response, the Army has begun to adapt to meet the challenges with more responsive, specialized, modularized, effects-based organizations or modules. These capabilities-based modules—centered upon the brigade combat team, the units of employment-tactical (UEX), and the units of employment-operational (UEO)—are right for our Army.

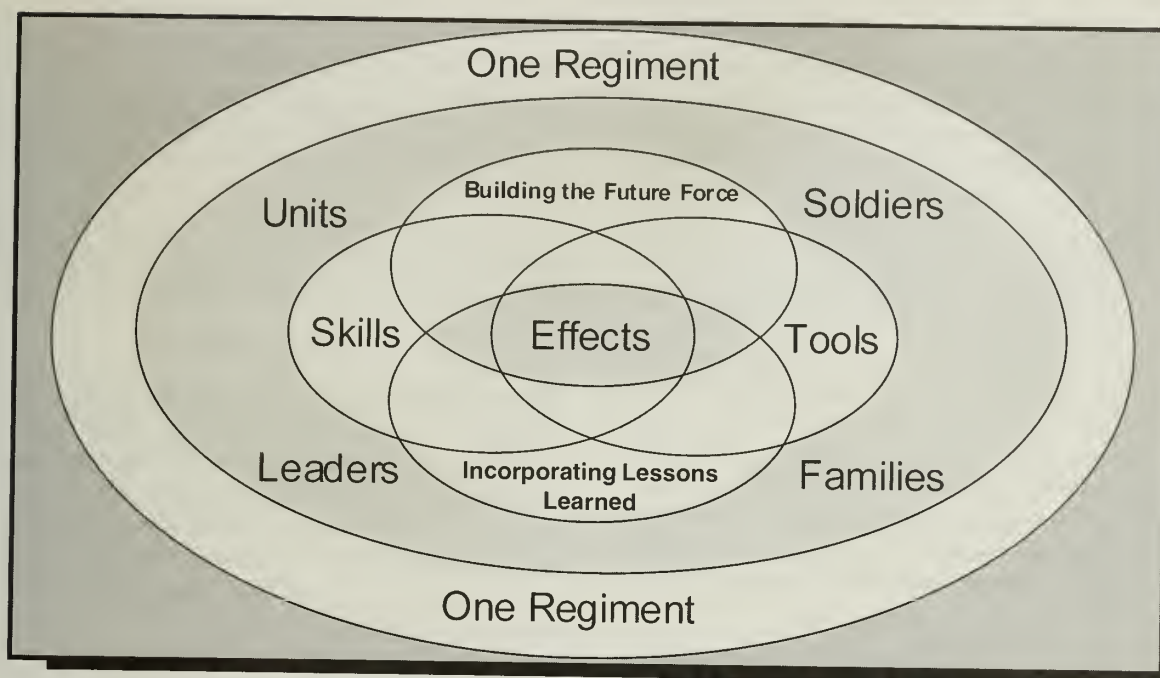
The Regiment you see as a result of modularity is not the Regiment of tomorrow. Several Department of the Army-level studies have shown that future engineer requirements have actually increased. These requirements, coupled with the number of engineer headquarters based on a “bottoms-up” process, will ultimately require more engineer structure than we had prior to modularity. At the brigade level is where we will mix and match modules. From the brigade level on down, we will be better able to provide a full range of support to our Army and to our Regiment. The message is loud and clear: “We’re coming back!”

A New Approach

The doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) assessment approach has served the Army and the Engineer Regiment well and is the foundation for the future. But we have to be much better at getting the skills and tools to our engineer Soldiers, staffs, and units to keep them indispensable to the land component maneuver commander. Our focus needs to be on continual “gap analysis” of engineer support to maneuver in urban and complex terrain. This approach also continuously incorporates today’s lessons learned and provides refinement in placing the right mix of skills and tools into our Future Engineer Force. This concept focuses our limited resources, maximizes our use of collaboration across the Regiment, and sets forth short- and long-term goals.

Skills

We must strive to ensure that our skills are relevant today and tomorrow and that they are indispensable to the land component maneuver commander. We have focused our efforts for years on engineer skills supporting maneuver in open and rolling terrain. Operations in urban and complex terrain—today and in the future—demonstrate the need for getting better skills for our Soldiers and staffs to enable mobility in concert with maneuver in such terrain. Soldiers must first be warriors, fully versed in battlefield fundamentals of “shoot, move, and communicate” and in expertly executing their military occupational specialties—from the moment they leave one-station unit training (OSUT) and advanced individual training (AIT). In addition to our mobility/survivability skills, sappers must be skilled in pattern analysis, change detection, search, reconnaissance, and terrain visualization. We all must be trained to expertly predict, prevent, detect, and avoid today’s improvised explosive devices (IEDs), bridge the gaps, ensure security of lines of communication, and many other engineer-unique missions. Specialized training such as the Sapper



To obtain the desired effects, we must possess the right skills and tools and incorporate the lessons learned of today while building the Future Force. All this must be done while keeping mindful of the criticality of our people—Soldiers, leaders, families, and units—all working as one team and one Regiment.

Leader Course, Urban Mobility Breaching Course, search courses, and specialty courses must be standards for our Soldiers and leaders. Finally, we must tighten the linkage between our Soldiers, leaders, and staffs in combat and our institutional schools and laboratories. Skills must also be linked with building future modular units. This must be a continuous approach where we constantly assess our current skills and update the training of our Soldiers, leaders, and staffs.

Tools

Our tools are—and always will be—our credentials and “stock in trade.” They are inseparable from our skills and the lessons learned from today’s operations and lead to the right effects for our Army. As with our skills, our tools have been designed to dominate open and rolling terrain. But today’s operations require our engineer tools to address the immense challenges of urban and complex terrain in addition to open and rolling terrain.

We are finding major equipment capability gaps for our Soldiers and units in providing assured mobility in urban and complex terrain. Some tools are out there—such as urban breachers, mine detectors, specialized explosives, mine and search dogs, RG-31 and Buffalo armored vehicles, and reconnaissance tools. In addition, the Digital Terrain Support System and TeleEngineering Kits are making great impacts. All engineers must seek out and obtain these emerging tools. Much more work is needed in getting the right tools to our units and engineer staffs and making them more indispensable. Efforts in networked air and ground technologies to detect and neutralize explosives and other hazards are needed. Also, we need to pursue modernizing equipment for our sapper modules and for construction equipment in building and

maintaining lines of communication (ports, airfields, and roads), logistic support areas, and lodgment areas.

Lessons Learned

We cannot develop relevant skills and tools for our Soldiers, leaders, and units without incorporating observations, needs, and lessons learned. Our manning and equipping strategies must be closely linked with the Total Engineer Force, continuously gaining feedback and sharing developments. It is critical for our units to forward lessons learned and recommended solutions to our institutions, because they provide an incredible windfall of information to develop solutions for better skills and tools. This not only yields better Soldiers and units but also provides invaluable feedback to our concepts teams as we craft the Future Engineer Force.

Future Engineer Force

We continue the massive efforts associated with transforming the Engineer Regiment into a more responsive and effective organization for our Army. The future engineer structure will provide more leadership challenges, opportunities, and professional development for our Soldiers and leaders than we have had in the past. Our Future Engineer Force is a total, top-to-bottom design of the Regiment that—

- Is capabilities- and module-based.
- Brings to bear the entire Regiment.
- Provides professional growth.
- Mixes and matches the right effects for the operation from across the Regiment.

This is an exciting period in our history. We are about to bring to life the concept of the Future Engineer Force by activating and converting units this summer. The complete transformation of our Regiment will take a little more than five years. Our organizations will be more versatile and responsive—capable of providing all facets of engineer support. Our command and control capabilities will be greatly expanded and—perhaps the best news for our Regiment—we are fixing the logistical support to our organizations. Our battalions in the Future Engineer Force will have a forward support company in addition to a headquarters and headquarters company. We have worked very closely with the US Army Combined Arms Support Command (CASCAM) in developing a very capable support structure that will serve us well into the future. Bottom line: “We’re coming back”... in a modular form that is configured to support tomorrow’s Army, with a greater number of engineers than we had before modularization.

People

Our Regiment is people—our Soldiers, Department of the Army civilians, leaders, allies, and families must always be the centerpiece of our actions if we want continued success. They ultimately put the skills and tools

together to produce the desired effects for our Army. We must provide defined career paths, opportunities for professional growth, and missions filled with challenges and rewards in order to acquire and retain quality Soldiers, leaders, and civilian employees. Also, we must solidify programs to address needs and concerns of our families. To accomplish this, we must constantly and effectively communicate both internally and externally in this rapidly changing world.

One Regiment

With such a diverse organization filled with talented people, our goals of providing the absolute best skills and tools for our Soldiers, leaders, and units can certainly be realized. A thought process where we gauge our progress and win as a team is needed: Skills and Tools! It is clear that the Engineer Regiment has an incredibly bright future. Let’s work together to pave the way for those to follow! Essayons!



Major General Castro is the Commandant, US Army Engineer School, Fort Leonard Wood, Missouri.

Lieutenant Colonel Grosskruger is the Chief of Staff, US Army Engineer School, Fort Leonard Wood, Missouri.

(“Clear the Way,” continued from page 2)

I am especially excited to tell you about the **Future Engineer Force**. We continue the massive efforts associated with transforming the Total Engineer Force into a more responsive and more effective organization for our Army. We do not see the engineer force structure reducing in size, as many had thought. The future engineer structure will provide as many, if not more, leadership and professional development opportunities for our Soldiers and leaders as we have in the past. The resonating message I send to you is that the senior leadership of our Army sees the need for a strong Engineer Regiment, and the future is very bright. **“We’re Coming Back!”**

Solving the IED challenge is a top priority for the Engineer School. I see the need for our Soldiers to quickly and remotely detect and neutralize any IED threat. To accomplish this, we must spiral cutting-edge equipment from industry into our engineer formations using innovative acquisition methods. The Army’s **Counter Explosive Hazards Center (CEHC)** at the Engineer School is leading this endeavor, teaming with our Regiment and many elements within the Army, the Department of Defense, our allies, and industry to spiral capabilities into our formations as quickly as possible to defeat IEDs. Much work has been done, but we are far from reaching our goal. We will partner with the National Training Center to have a **Leaders’ Council on IED Defeat in June at Fort Irwin, California**.

Another new capability is the **67th Mine Dog Detachment**. It has mine dog squads deployed to Afghanistan and specialized search dogs (SSD) deployed to Iraq. Furthermore, mine dog training in the United Kingdom is going very well.

Much work is being done to **spiral equipment into the field force** faster than the current procedures. Equipment such

as Tactical Fire Fighting Trucks, Handheld Standoff Mine-Detection Systems (HSTAMIDS), Buffaloes, Meerkats, and Skid Steer Loaders are some examples. While the Mongoose (an improved version of the mine-clearing line charge [MCLIC]) contract was put on the shelf, significant strides were made in the decision to shift money to procurement of the AN/PSS-14 mine detector. We are very close to replacing our armored-vehicle-launched bridges (AVLBs), buying all our DTSS requirements, and getting the money needed to modernize our construction equipment.

The Engineer Regiment is a **“Team of Teams,”** a diverse organization comprised of the leadership within the Total Engineer Force (Active Army, Reserve, and National Guard), the US Army Corps of Engineers, Engineer leaders within our major commands (MACOMs), our Joint Commands, our combat training centers, industry, Department of Defense civilians, engineers in our Allied forces, and our sister service engineers. We are now establishing an Army Knowledge Online Collaborative Web site in order to get information out to the field faster! (See article on page 7.) The collaborative Web site is only the short-term goal. The long-term goal is for everyone in the Engineer School to be connected digitally with the field with “interactive” tools. This collaborative method will greatly enhance our abilities to develop innovative solutions.

Let me conclude by again thanking you for all you do for our Army and our Engineer Regiment. We see our mission at the Engineer School as ensuring that we set the conditions for your units to do this for years to come. On that, we are fully committed, and together we will succeed. You are our Nation’s greatest treasure, and we are proud of you. Stand tall and **Carry On!**

Essayons!

Communication— The Key to Our Success



By Lieutenant Colonel Paul L. Grosskruger

The Engineer Regiment is a “Team of Teams,” a diverse organization comprised of Reserve, National Guard, and Active Army units; the US Army Corps of Engineers® (USACE); engineer leaders in our major commands, joint commands, combat training centers, and industry; and engineers in our allied forces and our sister services. If harnessed, the possibilities for information sharing and collective problem solving across our organization are endless. While simultaneously engaged in operations and transformation, communication within our Regiment is more essential than ever! Our major efforts in strategic communication in 2004 centered on visits to engineer commands around the world, the ENFORCE Conference, the Councils of Colonels, the Commandant’s video teleconferences (VTCs), the Engineer Professional Bulletin, and hosts of conferences both here at Fort Leonard Wood and in the field. We must, however, do much better with communication and harnessing our finite resources of funds and time in 2005.

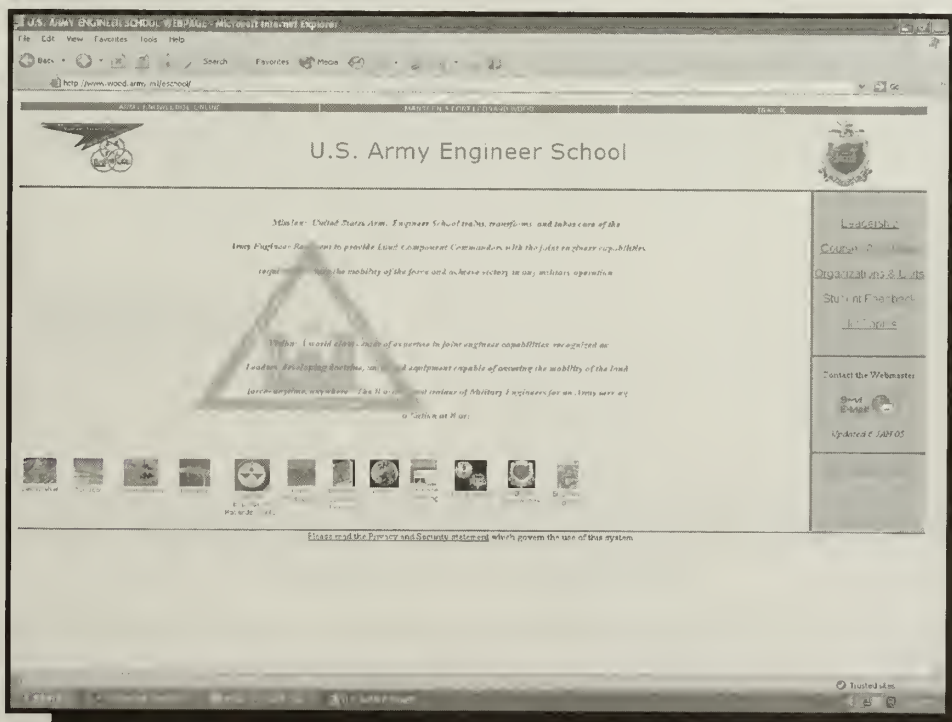
Some work was done within the US Army Engineer School on collaborative techniques to more effectively communicate with the field, but much more needs to be done. The Army Knowledge Online (AKO) collaborative Web site, located under the US Army Training and Doctrine Command (TRADOC)/Engineer School, will take more shape in the months ahead. The goal is for all leaders of the Regiment to use this tool often for getting the most current information, providing comments for various initiatives, and providing up-to-date responses to requests for information. A goal in 2005 and beyond is to work more on using collaborative feedback with the Total Engineer Regiment—utilizing the phenomenal levels of expertise and insights of our Soldiers and leaders.

US Army Corps of Engineers

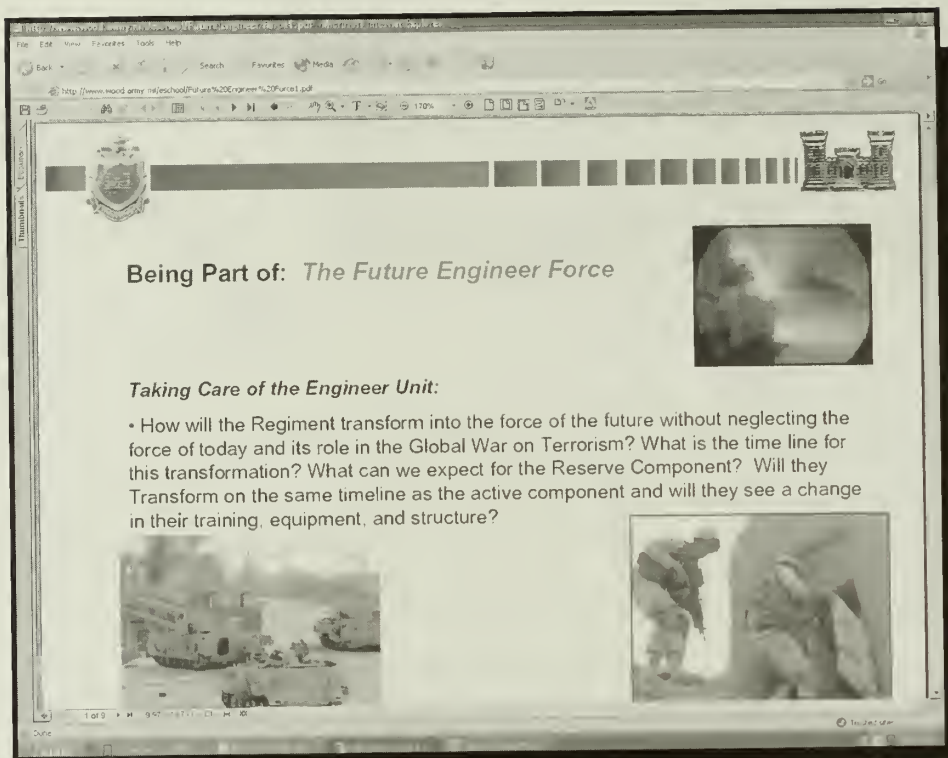
The Engineer School and the USACE Public Affairs Office are teaming in 2005 to send out periodic newsletters and updates via e-mail. This systematic “push” of information gives the members of our Regiment the most recent situational reports (SITREPs), messages, briefings, and actions with the purpose of keeping current on “big-picture” developments. Additionally, beginning this year, the Engineer School will publish a Regimental Letter from the Commandant that is intended to inform every Soldier in the Regiment.

Engineer School Web Page

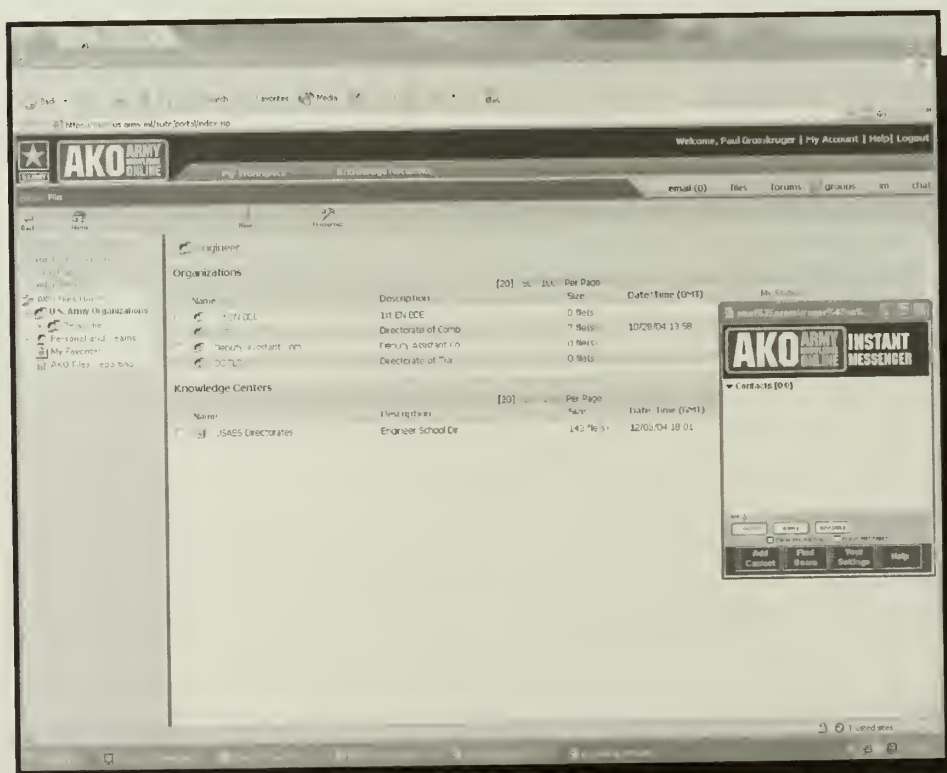
The nonsecure Internet protocol router (NIPR) Web page at <http://www.wood.army.mil/eschool/> will continue to provide up-to-date, open-source information on the Engineer School’s mission and vision, the directorates, and course information. This will continue to be



Engineer School Home Page



Engineer School Web Page



Army Knowledge Online Home Page

used to disseminate information on general topics such as upcoming events and points of contact and for collecting requests for more information. Check this site for periodic messages and themes to the Regiment from the Engineer School.

Army Knowledge Online

An area packed with potential is the Army Knowledge Online (AKO) Collaborative Knowledge Center at <https://www.us.army.mil/suite/portal/index.jsp>. Under TRADOC, the Engineer School has a site that has general "For Official Use Only (FOUO)" information and has files for staffing and collaboration between the Engineer School directorates and leaders of the Regiment. More collaboration at the FOUO level within our Regiment—using this site—may be our "way ahead" in harnessing our limited time and resources while simultaneously ensuring that all stakeholders share in the development of holistic solutions.

Secure Web Sites

There is a tremendous amount of information on the secure Internet protocol router (SIPR) knowledge sites within our major commands and functional task forces, such as that on improvised explosive device (IED) defeat. Expanded use of SIPR by our institutional base "operationalizes" the workstations of our decision makers across the Regiment. This means of secure collaboration tackles the challenges of coordinating operations across the globe, while also addressing the critical need for constant operational security. It is definitely only the beginning, since collaborative capabilities on SIPR knowledge sites are improving dramatically.

Lieutenant Colonel Grosskruger is the US Army Engineer School Chief of Staff. Previous assignments include command of the 94th Engineer Battalion (Combat) (Heavy), V Corps Assistant Corps Engineer, S3 of the 36th Engineer Group, and executive officer of the 317th Engineer Battalion (Mechanized). He also commanded the 535th Engineer Company (Combat Support Equipment) and Headquarters and Headquarters Company, 82d Engineer Battalion (Mechanized).

TRAINING LEADERS FOR COMBAT

By Lieutenant Colonel Shawn Howley

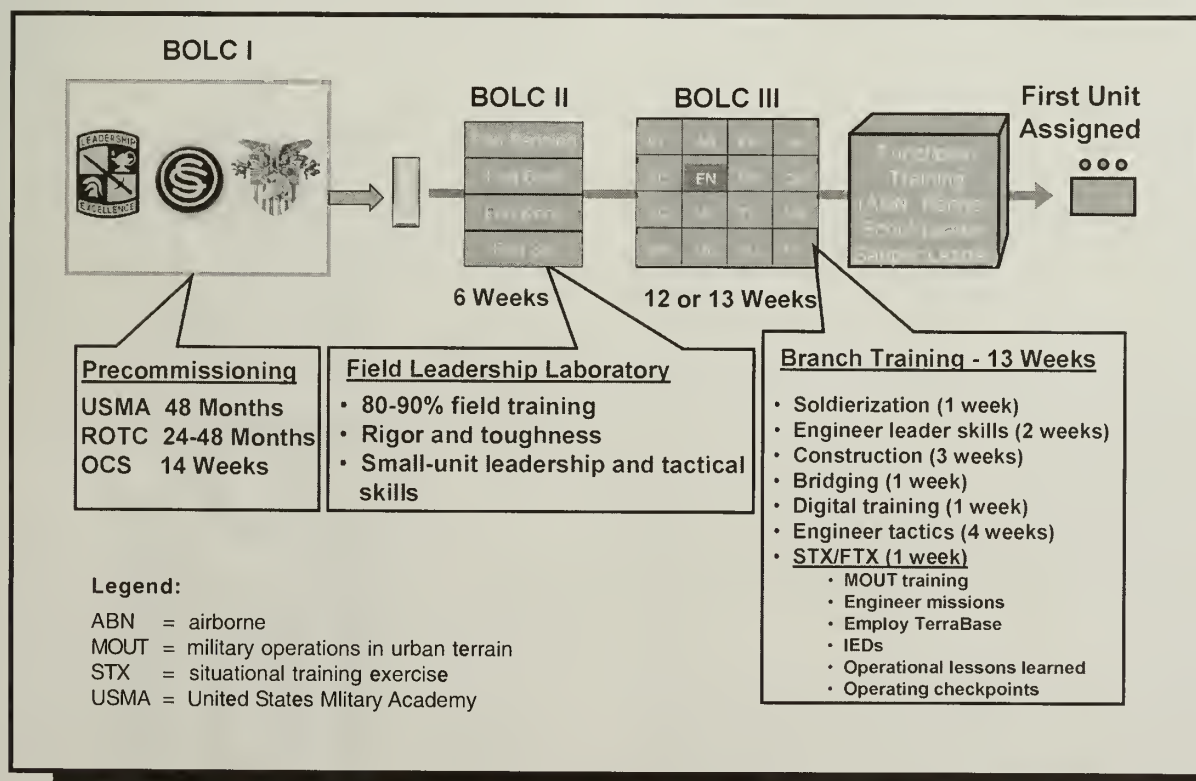
Teaching, coaching, and mentoring are basic blocking and tackling tasks of leader development, and that's what the "Dragon Battalion" is all about! The 554th Engineer Battalion conducts training and leader development to produce technically and tactically competent, adaptive, disciplined, and fit engineer officers for the Regiment. The battalion trains both Active Army and Reserve Component officers in the Engineer Officer Basic Course (EOBC), Engineer Command and Staff Course (ECSC), and the Precommand Course (PCC) and trains warrant officers in the Warrant Officer Basic Course (WOBC) and Warrant Officer Advanced Course (WOAC). The primary mission of the 554th is to train engineer lieutenants for combat, and the battalion has transitioned the training and education of the lieutenants in four distinct ways:

- Started small-group instruction for the EOBC.
- Redesigned both the tactics and engineering blocks of instruction to better focus on urban and complex terrain.

- Redesigned the field training exercise (FTX) to be an all-encompassing exercise, stressing troop-leading procedures, tactical skills, and engineering skills.
- Sent qualified lieutenants to follow-on combat preparatory courses on their way to their next unit of assignment. The overarching focus for the lieutenants is to be able to "shoot, move, communicate, and engineer." (Yes, the lieutenants *do* qualify on their M16, land navigate both dismounted and mounted, communicate tactical tasks on the radios, and build and blow up stuff in this battalion!)

The current organization and focus of the 554th is in an interim stage as the Army transitions in March 2006 to the new Basic Officer Leader Course (BOLC). BOLC (Figure 1) has three phases:

- BOLC I is the Reserve Officer Training Corps (ROTC) and Officer Candidate School (OCS) commissioning source.



BOLC Model

- BOLC II is a combined arms training phase focused on small-unit tactics.
- BOLC III is technically focused (for engineers) on assured mobility and field force engineering.

The 554th is currently training about 80 percent of the curriculum that will be used in BOLC III. It is continuing to refine and improve the instruction as it incorporates observations and lessons from the field. The battalion is currently in a transition point between decades of "that's the way we've always done it" and "shaping" the training and education methods that will allow it to execute the BOLC III mission, while simultaneously preparing leaders for combat.

On 15 November 2004, the battalion began training EOBC lieutenants at the small-group level with captains as small-group instructors (SGIs). The method is much the same as the way we train captains in the ECSC with small-group leaders (SGLs). The SGIs are selected from a graduating ECSC class and are placed in an "SGI Academy" much like the Observer/Controller-Trainer Academy at one of the combat training centers. While in the SGI Academy, they attend the Instructor Training Course (ITC) and become familiar with the processes that support EOBC and instructional blocks they will teach to the lieutenants. A typical EOBC class of 70 officers is divided into four teams of approximately 16 to 17 lieutenants. An SGI is responsible for training, educating, and developing each team. The training and education is coordinated with the large-group "platform" instructors from the Tactics and Engineering Division in the academic section of the battalion to ensure that the appropriate method of instruction is used, based on the subject to be trained. Close coordination with the large-group instructors and the SGIs also supports the consistency in the instruction between the small groups.

The tactics and engineering blocks of instruction have been refocused to better train the lieutenants on urban and complex terrain operations. The battalion has incorporated lessons learned from current operations in Iraq and Afghanistan into lesson plans to better prepare the officers for their "first unit of assignment" ... in *your* platoons! Some of the improvements made in the tactics block are improvised explosive device (IED) awareness, urban breaching techniques, and assured mobility fundamentals. Improvements in the engineering blocks include force protection, quality control, infrastructure reconnaissance, and reinstituting "hands-on construction" at Fire Base Thunder, the battalion forward operating base in the Fort Leonard Wood training area. Senior officers will remember this as "Project Hammer" training, during which there was "hands-on construction" training for lieutenants. The purpose of restarting this training is to familiarize the junior leaders with quality control and project management of a construction project.

The FTX is the "capstone" event for the lieutenants' training in the Dragon Battalion. The lieutenants execute a 2-week exercise during which they plan, prepare, and execute tactical and engineering missions. Some of the missions are

route reconnaissance, bridge reconnaissance, react to contact, airfield reconnaissance, and infrastructure reconnaissance—all consistent with a Southwest Asia area of responsibility. There is a common training theme in which the instruction taught in the tactics block will be revisited in the FTX, as well as the engineering block. The Opposing Force (OPFOR) is dressed in a mix of old military uniforms and/or "Arabic regional-style clothing" such as the *salwar kameez*, a very long shirt and pants.

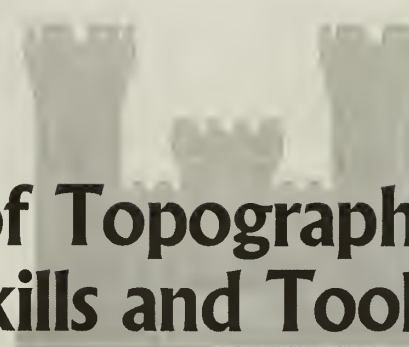
The 554th further prepares junior leaders for combat by coordinating directly with the Engineer Branch to obtain slots for the Ranger School, Sapper Leader Course, and Airborne School, just to name a few. The battalion has been successful in these courses and continues to strive to get lieutenants in other courses to better prepare them for their units. Other courses being planned for lieutenants to attend are the Scout Leaders Course and the Bradley Leaders Course.

Teaching, coaching, and mentoring are still the foundations upon which we train and educate leaders for our Regiment. The 554th Engineer Battalion is totally dedicated to ensuring that the officers it trains are as prepared as it can possibly make them—for your unit, the Regiment, and the Army.



Lieutenant Colonel Howley is the Commander, 554th Engineer Battalion, and Chief, Department of Instruction, US Army Engineer School, Fort Leonard Wood, Missouri. He previously served with the 130th Engineer Brigade, Camp Victory, Iraq; 1st Cavalry Division, Fort Hood, Texas; 3d Infantry Division, Schweinfurt, Germany; and the 10th Mountain Division, Fort Drum, New York. He holds a master's in human resource development from Webster University.





Integration of Topographic Engineering Skills and Tools –

Providing Assured Mobility With C2 Systems

By Mr. Ken Bergman

Officer career-level topographic engineering instruction at the Engineer School incorporates skills and tools for top-level command and control (C2). Engineer School students must understand how topographic engineering fits into the big picture regarding the supported unit's overall C2 architecture. Students who attend the Engineer School should leave Fort Leonard Wood knowing how to integrate topographic engineering solutions into the big picture in order to meet the maneuver commander's needs for assured mobility.

Topographic Engineering Skills and Tools

Maneuver commanders are effective on the battlefield only to the extent that they understand the tools and assets under their command. The ability of commanders is multiplied many times by the level of skill with which they apply the right tools to a given situation. Likewise, engineer officers are successful in providing topographic support only to the extent that they understand and apply the tools available, from the tactical level all the way back to home station operating capability (HSOC) sites in theater and in the continental United States (CONUS). Engineer C2 supports terrain understanding, improvised explosive device (IED) defeat, humanitarian relief, stability operations, support operations, and other functions that are critical components for achieving assured mobility. Following is an overview of C2 integration topics that are laid out in a question-and-answer format.

What types of terrain data do I need to know about?

Skills and tools associated with topographic engineering begin with an understanding of terrain data and its uses. Terrain data consists of scanned digital map displays, elevation data, imagery, and feature data.

Scanned digital map displays consist of Compressed Arc Digitized Raster Graphics (CADRG) files, which are used extensively in C2 systems. CADRG consists of paper maps of

all scales that have been scanned and are suitable for digital map backgrounds. CADRGs at 1:50,000 and 1:100,000 scale are the most widely used for tactical operations. City maps at a 1:12,500 scale or better are also available but will not show all buildings. (This can be achieved using georeferenced imagery.) Like imagery, CADRG digital maps do not show any more detail when you "zoom in" to a higher resolution; this just makes the existing features appear larger.

Elevation data has varying levels of detail: Digital Terrain Elevation Data (DTED®) Level 1 (roughly 90-meter post spacing, bare earth); DTED Level 2 (30-meter post spacing, bare earth); Shuttle Radar Topography Mission (SRTM) 2 (30-meter post spacing, reflective surface or "treetop" data); and high-resolution terrain elevation (HRTe) data (HRTe 3, 4, and 5, at 10-meter, 3-meter, and 1-meter post spacing, respectively, reflective surface). DTED Level 1 has approximately the same level of detail that the contour lines of a 1:250,000-scale map joint operational graphic (JOG) would have. Maps at a 1:50,000 scale can be used successfully with DTED Level 2 and SRTM elevation data for line-of-sight analyses and weapons fans, but the use of DTED Level 1 with 1:50,000-scale CADRGs should be discouraged due to inaccuracies in lower-resolution elevation data.

Georeferenced imagery typically consists of Controlled Image Base (CIB) 5 (5-meter resolution), CIB 1 (1-meter resolution), and commercial satellite imagery. CIB imagery is useful for image map backgrounds and to display features that are not represented on digital map backgrounds. However, the image map is not a replacement for standard topographic line maps (TLM). CIB 1 is particularly useful in urban areas, but it may not provide the desired resolution for detailed urban analysis.

Vector data, also called *feature data*, provides digital representations of man-made or natural objects as points, lines, or polygons (such as wells, roads, and forests). Each feature can include embedded information, called "attribution," such as bank heights for bodies of water, type of road surface, road

width, and bridge load-bearing class. Attribution has been called "right-click" data because information like road width and road materials is embedded in the feature. On the screen, these features look like map data, but when you right click on them with a mouse pointer, attributes about that feature are displayed. Not all feature data is fully populated, but it is still useful for display purposes. Fully attributed feature data can be used to perform automated terrain analysis or terrain reasoning.

What topographic assets do I supervise as an engineer officer?

The Digital Topographic Support System (DTSS) brings world-class geospatial support functionality to the tactical warfighter. Army terrain teams with DTSS are in high demand in current operations, and the number of terrain analysts in the field is increasing. The DTSS is being fielded to all Army terrain teams in the Stryker Brigade Combat Teams (SBCTs), unit of action (UA) brigade combat teams (BCTs), units of employment-tactical (UEX), and units of employment-operational (UEY). There are also other geospatially enabled tools available to engineers, to include the Tactical Minefield Database (TMFDB), Mobile Command System-Engineer (MCS-E), High-Volume Map Production (HVMP) System, Theater Geospatial Database (TGD), and emerging handheld personal digital assistants (PDAs) that use embedded geospatial software. The configuration of different units may vary depending on the echelon and legacy of the individual unit. The software used in each of these products is compatible with DTSS. For more information on these tools, see the Project Director (PD), Combat Terrain Information Systems (CTIS), Web site at <http://www.tec.army.mil/systems/programs/ctis2/about/main.html>.

Regarding the use of these tools, it is essential that engineer officers understand the following:

- Engineer officers are the "masters of terrain," both digitally (such as terrain analysis) and physically (such as emplacing obstacles and clearing maneuver routes).
- Engineers at SBCTs and maneuver BCTs (UAs) need to ensure that terrain teams and the DTSS are fully operational.
- The S2/G2 is an important customer of the terrain teams. At the UEY, a portion of the DTSS is colocated with the intelligence section.
- Engineer officers must also ensure that other users (such as the operations, fire support, and aviation sections) receive needed terrain-related products and that terrain teams have what they need to be successful in achieving their mission.

What topographic "reachback" support can I get?

The Army has significant reachback infrastructure to support terrain teams and engineer officers in the field. Tactical-level terrain teams are deployed down to the brigade level

(UA). Reachback consists of terrain teams at division and corps levels (UEX and UEY); the regional HSOC, to include topographic engineering battalions and the TGD; and the US Army Corps of Engineers® Engineer Research and Development Center (ERDC) Topographic Engineering Center (TEC). Large-bandwidth communications architectures are being developed—such as the Global Broadcast Service (GBS)—to disseminate very large files into theater.

A variety of tools available to engineer officers can convey terrain understanding to the user. One of these is the Urban Tactical Planner™ (UTP), which is available through TEC. The UTP is a stand-alone software tool that is free, easy to use, and runs on any personal computer (PC). Most of the major urban areas in current operations areas are covered by a specific UTP three dimensional (3-D) fly-through loaded on a compact disk (CD), using a TerraExplorer® software package. The UTP fly-through is created using imagery and feature data draped over elevation data. Feature attribution is accessible by placing the cursor over a road feature. Key buildings in the imagery are annotated, and some are "stood up" in 3-D. DTSS operators can use UTP source data as a foundation for their urban analysis products. They can add more feature data and update existing UTP databases based on ground truth in the field.

In addition to UTP, there are other countrywide TerraExplorer files that cover entire countries or regions, but they are typically disseminated on a FireWire (an external hard drive that contains large files, via a Universal Serial Bus [USB]-2 connection). Countrywide fly-throughs and UTPs are built and disseminated by TEC and can be edited and enhanced by terrain teams in theater using DTSS. These products are available to soldiers by contacting TEC. For more information on these and other products, go to the TEC Web site at <http://www.tec.army.mil>.

The National Geospatial-Intelligence Agency (NGA) provides the ultimate reachback asset in CONUS, as well as in theater, with on-site geospatial analysts who augment the terrain teams. NGA analysts should be integrated with the terrain teams to provide excellent synergy. NGA teams supplement Army terrain team capabilities but do not replace them. Coalition partners can also be crucial to the success of an operation in theater. When Army units first arrived in Afghanistan, it was the Australian topographic engineers who provided the most useful maps. Australian, British, and Canadian topographic engineers use the same software configuration as DTSS, making them readily compatible with US Army terrain teams. US Marine Corps terrain teams also use software that is compatible with DTSS.

What engineer solutions/products are needed in different C2 systems?

Part of the answer to this question can be found in Training Circular (TC) 5-230, *Army Geospatial Guide for Commanders and Planners*. It contains explanations and examples of some of the common types of overlays and products that DTSS

produces for digital or hard-copy use by customers in different functional areas. In addition, the terrain teams in theater are using customized products that support IED defeat.

Integrating Topographic Solutions in Today's C2 Environment

To understand where we are in today's C2 architecture, we need to examine the recent past in fielding various C2 systems. The Army's C2 environment has a variety of components, some of them developed through the traditional acquisition cycle and some through ad hoc associations with the joint community. The Army Battle Command System (ABCS) incorporates different functional area C2 tools, to include the following:

- Mobile Control System (MCS) for operations.
- All-Source Analysis System (ASAS) for intelligence.
- DTSS for topographic engineering support.
- Advanced Field Artillery Tactical Data System (AFATDS) for fire support.
- Air and Missile Defense Workstation (AMDWS) for air defense.
- Battle Command Sustainment Support System (BCS3) for logistics.
- Tactical Airspace Integration System (TAIS) for aviation.
- Force XXI Battle Command-Brigade and Below (FBCB2) for tactical- and platform-level operations.
- Global Command and Control System-Army (GCCS-A) for joint connectivity.
- Integrated Meteorological System (IMETS) for weather.

The ABCS was fielded to the digital divisions and the SBCTs prior to Operation Iraqi Freedom. Various parts of the ABCS were available to other units. One ABCS capability that was rushed into the field for Operation Iraqi Freedom was the FBCB2 and its commercial satellite surrogate known as Blue Force Tracking. The digitized divisions were equipped with DTSS down to the brigade level, while the nondigitized divisions had only division-level terrain teams. It is clear that ABCS provides extensive C2 capabilities for the major functional areas in the Army. However, prior to Operation Iraqi Freedom, not all units had ABCS; there were digital and nondigital units, which left some users without a standard C2 architecture.

Given the varied C2 configurations, V Corps did not have adequate C2 support because of the ABCS shortfall. While Operation Iraqi Freedom was in its planning stages, commanders decided that the nondigitized units needed some C2 tools quickly. They chose to use Command and Control Personal Computer (C2PC) because it is free, reliable, easy to use, and runs on any PC. C2PC was employed in the initial stages of Operation Iraqi Freedom and is still being used at the corps and joint levels in Iraq and elsewhere.

The Army is preparing to release Software Block 1, based on ABCS, which will be fielded to the entire Active Army and Reserve Component. There will be accelerated fielding of these new digital systems to nondigital units over the next two to three years. This will provide the Army with needed C2 standardization.

FalconView™ is a terrain visualization tool that is used extensively in Operation Iraqi Freedom and throughout the Army. Like C2PC, it is free, reliable, easy to use, and runs on any PC. Planning teams use FalconView to view digital maps and imagery and to build control measure overlays for export to other C2 systems. It can also serve as a data interchange tool between ABCS and C2PC.

Engineers need to build an understanding of these tools and their role in C2. DTSS can provide digital products to all of the ABCS C2 tools and C2PC. Commanders and battle staffs will require varying types of geospatial products, depending on their individual experience base and unique requirements. It is essential that engineers understand how to help commanders achieve assured mobility by providing responsive products to the battle staffs and their respective C2 systems.

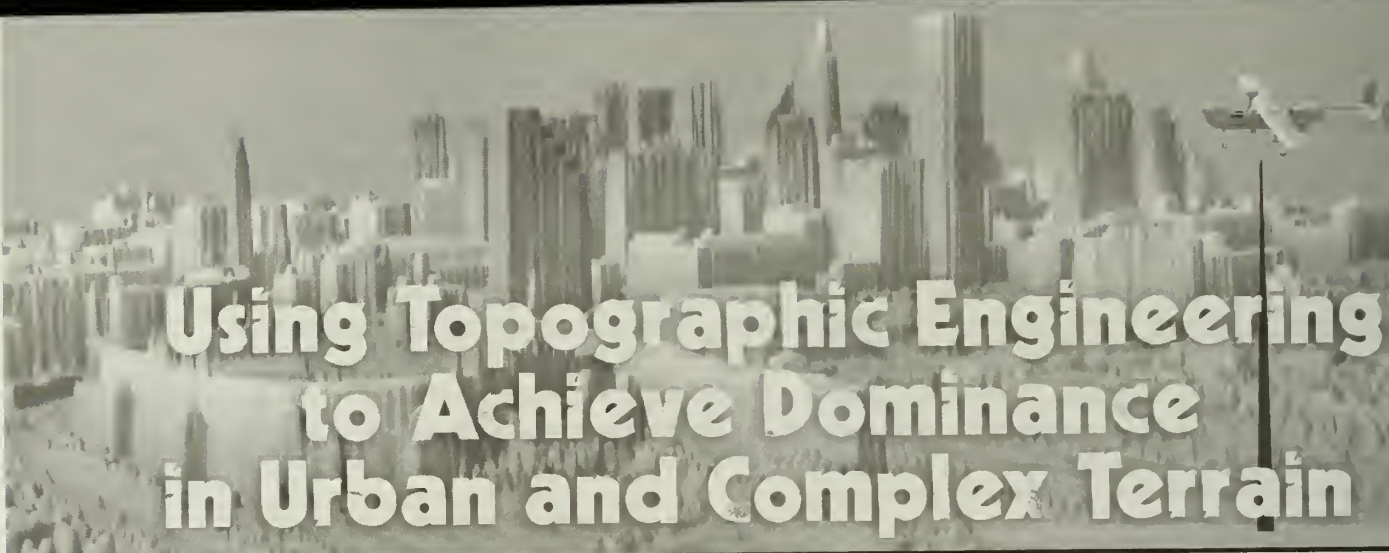
How do I export digital engineer solutions into different C2 systems?

Exporting topographic products to C2PC can be achieved by terrain teams using export tools directly from DTSS or by sending files from DTSS to FalconView and then transforming files into C2PC format. DTSS can reformat products for export to almost any other system. Only the Joint Technical Architecture-compliant systems that use the Commercial Joint Mapping Toolkit (CJMTK) can use all NGA and DTSS products in their native formats. There is a wide range of proprietary and nonstandard map viewers used by non-ABCS and many ABCS systems. This is a continual challenge to DTSS operators. Fortunately, MCS and ASAS in ABCS 6.4 Army Software Block 1 will use CJMTK in the future, ensuring seamless interoperability of geospatial information within the ABCS.

What about dissemination?

There are many graphics that depict dissemination of data, with "lightning bolts" going from one system to another. At higher levels of command, large files can be transmitted into theater using GBS and other large-bandwidth capabilities. However, for the last tactical mile, soldiers typically use high-frequency radios. Digital overlays that are disseminated via radio should contain as much information as possible with a very small file size. CDs, digital video disks (DVDs), and FireWires are often used to disseminate large files. In digitized units, hard drives loaded on mounted vehicles contain a small standard basic load of geospatial data. At the Central Technical Support Facility (CTSF), Fort Hood, Texas, the system master hard drive is loaded with operational software and required terrain data. The master is then replicated to many hard drives

(Continued on page 48)



Using Topographic Engineering to Achieve Dominance in Urban and Complex Terrain

By Mr. Ken Bergman

Maneuver warfare concepts have been developed and used very effectively over the past three decades to achieve unprecedented levels of success in Operation Desert Storm in 1991 and Operation Iraqi Freedom in 2003. Much of the combat in these conflicts entailed operations in open and rolling terrain. The reason we dominate maneuver in such terrain is largely due to the fact that we dominate the information in that environment, and we are able to deploy weapons systems and maneuver platforms that overcome threat forces before they can interdict our forces.

In contrast, urban and complex terrain presents a more challenging operating environment in that threat forces can get closer to our soldiers before we can bring superior combat power to bear. Unless we are properly prepared, threat forces can make devastating attacks on our units in this type of terrain. The threat can employ explosive devices and snipers to hit allied targets of opportunity and can also employ suicide bombers in vehicles.

Information dominance and dominant maneuver are harder to achieve in urban and complex terrain, but there are measures we can take to give our soldiers important advantages. Engineer solutions include physical measures to interdict threat forces, such as countermine operations and emplacement of barriers, as well as command and control (C2) measures that can enhance our information dominance. This article focuses on how the topographic engineering component of information dominance helps achieve dominant maneuver in urban and complex terrain.

C2 capabilities are closely associated with any information dominance solutions. The "observe, orient, decide, act (OODA) loop" is a simple model for understanding C2.¹ The OODA loop is used unconsciously by competing opponents. The Army military decision-making process is a very detailed version of the OODA loop. At a very basic level, the OODA loop can be compared to a boxing match: A combination of speed and a variety of different punch combinations (as well as defensive parries)—delivered at a high tempo—can rapidly overcome an opponent. Extrapolate the OODA loop to a brigade

or higher echelon, and the level of complexity of divergent decision trees grows exponentially. Geospatial information and services (GI&S) provide the foundational basis for C2 decisions in all phases of the OODA loop, helping soldiers understand the lay of the land and act on that understanding, in both open and rolling terrain and urban and complex terrain.

Solutions Available Now

Combat field commanders are very focused on rapid solutions to meet their C2 needs. There are several topographic engineering tools available today that can help soldiers achieve a better understanding of the terrain and make better decisions. Each of these capabilities can be employed to help warfighters achieve assured mobility in urban and complex terrain with an accelerated and more effective OODA loop.

Urban Tactical Planner™ (UTP). UTP is a planning tool intended to support military operations in urban terrain (MOUT). It is a very capable, user-friendly tool for terrain understanding, but many people are still unfamiliar with this product. UTP provides an overview of the urban terrain in the form of maps, imagery, elevation data, perspective views, handheld photography, video clips, scanned building plans, tables, and text. It provides three-dimensional (3-D) visualization of key aspects of the urban environment—including buildings, roads, railroads, streams, forests, marshes, water bodies, and vertical obstructions (see Figure 1). UTP is intended for rapid dissemination on a compact disk (CD) and Intelink-S. The product can be built on short timelines to meet contingency planning requirements as they arise.

TerraExplorer® is a software package used to run UTP. The TerraExplorer viewer file runs on any laptop or personal computer, with no license fees; it can therefore be copied as often as needed and disseminated to as many users as required. Dissemination in the field is limited only by security procedures. UTP allows soldiers to view the terrain numerous times before deploying to an area. The US Army Corps of Engineers® Engineer Research and Development Center

(ERDC) Topographic Engineering Center (TEC) builds and disseminates UTP over many key urban areas.

TEC builds a separate custom product (regional fly-throughs) that uses the same TerraExplorer software found in UTP. This stand-alone product uses elevation data, imagery, feature data, and annotated points of interest to provide users with terrain understanding over a large area (hundreds of miles). Regional fly-throughs can consist of a single country or an entire region. Like UTP, the regional fly-through is easy to use and runs on any laptop or personal computer. It can be disseminated using a digital video disk (DVD) or a FireWire (external hard drive), depending on file size. It can be copied for as many users as needed, without cost, subject to security procedures.

Improvised Explosive Device (IED) Detection – Buckeye. Finding IEDs in urban and complex terrain is a challenging task, and geospatial technology is part of the solution. Many initiatives are in the planning phase or are going through research, development, and engineering processes. The Buckeye program has shown significant success in theater. Details regarding the program are available from TEC.

Handheld Geographic Information System (GIS) Personal Digital Assistant (PDA). GI&S tools have advanced to the point where they can now be deployed on Global Positioning System (GPS)-enabled PDAs. Cutting-edge PDAs in the field today enable users to digitize important features (such as road and bridge information, minefields, and obstacles). These PDAs are an early example of the soldier as a primary source of digital terrain data. It has been said that every soldier is a sensor. Handheld PDAs with embedded geospatial software enable the Army to implement this tenet in digital form.

Terrain Team Support. Terrain teams are the critical links between GI&S technologies and ground warfighters. The Army has fielded terrain teams with world-class GIS capabilities down to the brigade level. Army terrain teams are able to build rapid-response products that lead to terrain understanding, which is a key component of information dominance. The Digital Topographic Support System (DTSS) is the C2 system used by Army terrain teams. The DTSS is supported by the Combat Terrain Information Systems (CTIS) project office. Terrain teams produce customized terrain analysis products, 3-D fly-throughs, perspective views, masked area plots, line-of-sight analyses, and hard-copy printouts of custom geospatial products. Terrain teams in theater have been developing new methods to address the complex nature of urban terrain with cutting-edge analysis tools. Additional capabilities are provided using reachback to terrain teams at higher echelons (division and corps), theater-level Army assets (Theater Geospatial Database), TEC, and the National Geospatial-Intelligence Agency (NGA). Each level provides support to terrain teams at the “pointy end of the spear.” TerraExplorer software was recently delivered to the terrain teams, so they are now able to edit existing UTP products and regional fly-throughs and to build their own fly-throughs in theater from source data.

It is essential that we continue to sustain these teams with current, updated hardware and software and—more importantly—with trained, motivated soldiers who can make innovative products in the field to support the warfighter. It is also essential that these teams remain tightly linked to reachback assets to ensure that they have the very best possible products available for the maneuver element.



Figure 1. Urban Tactical Planner

Solutions Available in the Future

New technology solutions will give soldiers increased information dominance in the future. Some of these capabilities are available today in the commercial world and need to be packaged for use in the field. Other capabilities are still in the initial stages of development:

Light Detection and Ranging (lidar) Systems. Lidar uses an active energy source (laser) to find the range to a distant object. This is similar to radar, which uses radio waves to detect distant objects. Using the laser time of flight and precise location of an airborne or vehicle-mounted lidar sensor, this system can be deployed to collect extremely accurate elevation data (1-meter post spacing or better). This is a mature technology that is used throughout the developed world to achieve detailed terrain understanding and analysis. For example, cellular telephone companies can use lidar elevation data to find the optimal locations for towers to maximize communications coverage for their customers. In the tactical world, this data set can be used to build a number of useful products, to include detailed 3-D fly-throughs and line-of sight analyses; identify ambush sites, dead space, and avenues of approach; and generate detailed feature data (see Figure 2).

Important engineering tasks can be accomplished using lidar, to include repair of buildings and precise estimates of

volume and mass in a small hill of gravel or other material. For example, ground-based lidar was used to measure the size of granite slabs used to repair the Pentagon after 9/11, and airborne lidar was used to estimate the amount of material to be removed from the Twin Towers site in New York City. Applications for lidar in the tactical environment are readily apparent.

Urban Terrain Information Constructs (UTICs) - Battlespace Terrain Reasoning and Awareness (BTRA). This program is developing automated terrain reasoning tools for use on digital C2 systems. BTRA uses feature data with embedded attribution ("right-click") data and elevation data to provide live course of action (COA) analyses. The BTRA program has produced some useful cross-country tools for warfighters for real-world applications. Emerging BTRA developments are providing advanced, dynamic terrain reasoning tools to aid in the preparation, management, and assimilation of observation, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA), as it relates to intelligence preparation of the battlespace. The intent is to use both coarse and fine terrain data sets to build tools that will help achieve assured mobility.

UTICs is an initiative to build BTRA-like tools for terrain reasoning in the urban battlespace. UTICs will gain major

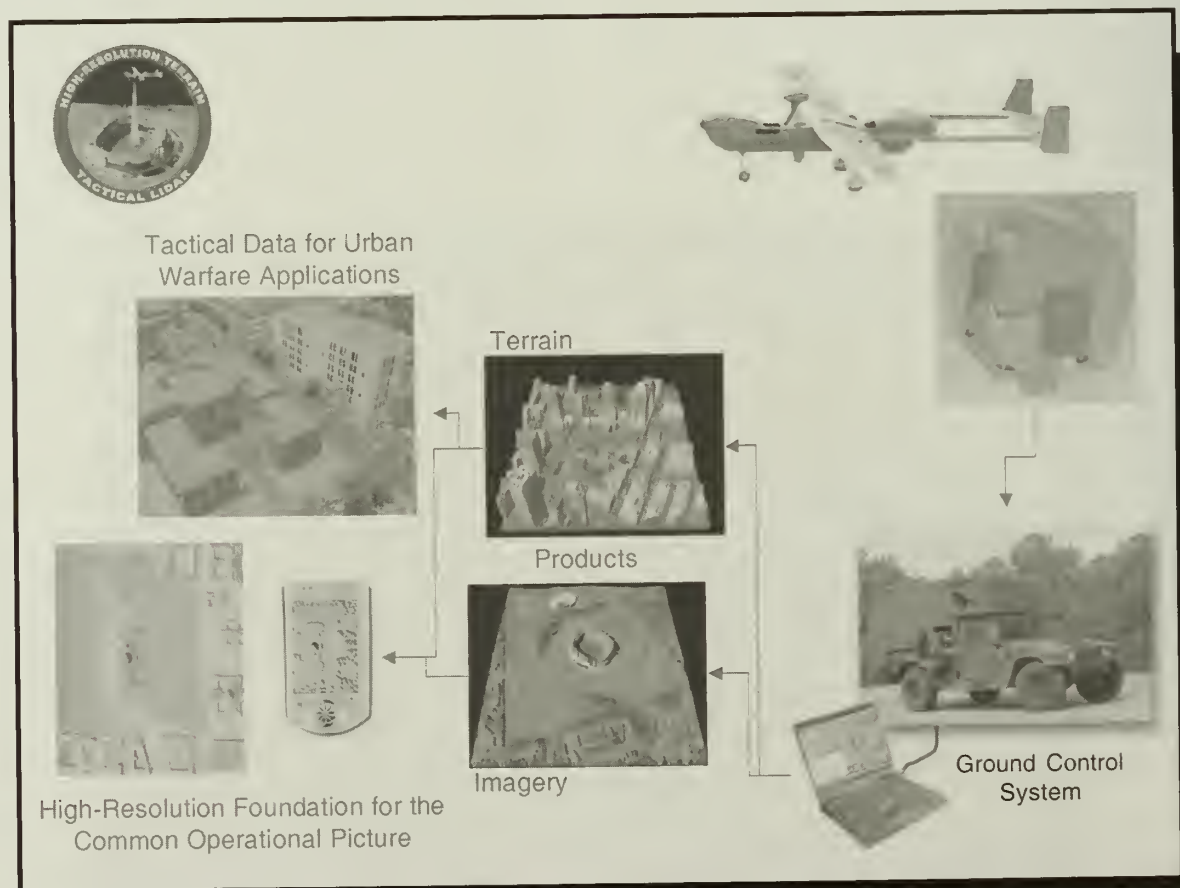


Figure 2. Tactical Lidar

computational efficiencies for dynamic situational understanding of the effects of urban environment by reasoning against critical geospatial aspects of urban terrain. By representing the urban and complex terrain as network- and object-based abstractions, soldiers will be able to rapidly make tactical decisions in a changing tactical environment, thereby increasing their pace of C2 decision making (achieving a faster OODA loop). Immense efficiencies can be gained in both the computation time required to perform COA analyses and the bandwidth requirements for transmitting/sharing decision support data. These geospatial capabilities will also provide a framework to support management of cultural and civil information that will be needed to support COA analyses demanded by the command requirements of the "3-block war."

UTICs endeavor to explore both the establishment and use of an abstract representation of urban environments, and the means to disseminate dynamic information to platforms on the move.

3-D Solid Terrain Models. TEC is building solid terrain models of several cities, with imagery embedded in the models, for numerous customers. Individual 3-D buildings are "stood up," and avenues of approach can be examined from various angles. These hard-surface models are produced using computerized elevation data linked to a machine that deposits layers of plaster that represent buildings. Colored plaster is deposited to represent imagery overlaid on the buildings. The plaster model is then hardened so it can withstand normal handling by users. These tools are different from digital 3-D fly-throughs, since users can handle the model, view the terrain from different angles, and brainstorm contingencies in a group setting. Many users employ this tool—in addition to computer-based visualization—to achieve better terrain understanding.

Joint Geospatial Enterprise Service (JGES) – Army Prototype Program (APP). JGES is an initiative that brings joint GI&S assets together in an enterprise (distributed) environment to maximize the availability of terrain data and products. One of the central aspects of JGES is the intent to capture, archive, and reuse terrain data, from national sources to the individual soldier. The JGES Initial Capabilities Document (ICD) has been approved by the Army Requirements Oversight Council (AROC). The JGES-APP is an initial effort to leverage and integrate distributed geospatial capabilities to support the warfighter. The JGES-APP architecture includes a central hub at TEC with connectivity to field sites (such as the Terrain Visualization Center at Fort Leonard Wood, Missouri) and overwatch support for deployed units in theater. Specific goals in the JGES-APP include understanding how to provide reachback support to field units; conflation (merging) of disparate terrain databases; dissemination of new products using limited bandwidth; and archiving and reuse of terrain data generated in the field. The JGES-APP is an early instance of enterprise GI&S support to the field.

Conclusion

While our forces have achieved phenomenal success in dominating open and rolling terrain, today's soldiers face significant challenges in urban and complex terrain. Information dominance can help overcome these challenges. GI&S capabilities provide a foundational aspect for our forces to achieve a more rapid and effective C2 decision cycle (OODA loop). Several tools are available for use today, while others are emerging from technology development programs. It is imperative that we understand and employ appropriate geospatial assets to achieve assured mobility in urban and complex terrain.



Mr. Bergman, a member of TEC, is assigned to Fort Leonard Wood, Missouri, where he supports the TRADOC Program Integration Office for Terrain Data. A Naval Academy graduate, he has a master's in systems engineering from George Mason University and is a former Marine.

Endnote

¹ The OODA loop is an information strategy concept for information warfare that was developed by Air Force Colonel John R. Boyd (1927-1997). He was instrumental in explaining and disseminating the concept of "cycle time" and "getting inside the adversary's decision cycle."



Attention Units!

Many post offices will not deliver mail without a street address. Please contact us to update your mailing address if the one we are using for you does not include a street address. Include the old address and your telephone number, as well as the corrected address, and e-mail this information to <engineer@wood.army.mil>.



Warrior Ethos, Tasks, and Drills Spiral Into Initial-Entry Training

What's in It for the Regiment?

By Major Janet Kirkton

*"This complex operational environment offers no relief or respite from contact with the enemy, from the lowest end of the spectrum of conflict to the highest. Soldiers are and will be under great stress, physically and psychologically, no matter what their rank, specialty, or location on the battlefield. Given this reality, all soldiers must be prepared to close with and destroy the enemy—all soldiers must be warriors first."*¹

*"With an Army at war, it's critical that every Soldier, upon graduation from initial-entry training, be prepared for combat. We've increased the rigor, and that puts additional demands upon our drill sergeants. But it's worth it for the men and women of this great country to have the skills and the intestinal fortitude to go forward and fight, right out of advanced individual training."*²

Warrior Tasks and Drills

Deriving operational lessons learned almost on a daily basis, the primary focus in the institutional training base and initial-entry training (IET) has shifted dramatically within the past 12 months. Given the harsh demands of campaigns in Iraq and Afghanistan and the complex terrain, IET graduates must be competent and confident immediately upon graduation. Bottom line: All soldiers must be warriors first, technical experts second.

Toward this end, the training base has been directed to increase rigor and implement a training strategy that inculcates the Warrior Ethos, and as resources are made available, spiral in the warrior tasks and battle drills. As the term spiral implies, each training cycle of one-station unit training (OSUT) and advanced individual training (AIT) will advance to a higher level until IET produces soldiers who can perform successfully in combat.

The fundamental changes in IET are a result of Task Force Soldier. General Peter J. Schoomaker, Chief of Staff of the Army (CSA), initiated Task Force Soldier in September 2003 for the purpose of equipping, training, and instilling the Warrior Ethos in soldiers. The CSA wanted to focus the Army's efforts on winning the Global War on Terrorism. He also wanted to ensure that training being conducted within the institutional training base was relevant and that every measure was being taken to prepare soldiers for combat.

Under the direction of Brigadier General Benjamin Freakley, a Warrior Task Site Selection Board was assembled, with the primary purpose of defining the goals of Task Force Soldier. One of the goals was compiling a list of essential tasks and drills in which all soldiers must be proficient. As recent history

has taught us, many soldiers finish IET and deploy within 30 days to a theater of operation. As a result, the selection of these tasks and drills was critical.

The final product of the Warrior Task Site Selection Board's labor is collectively known as the warrior tasks and drills (WT&D). The intent is to train the WT&D during basic combat training or OSUT and then reinforce those tasks during AIT. Although training these WT&D has already been initiated, the program of instruction (POI) and training support packages continue to be refined.

Warrior Ethos

Another key initiative is the inculcation of the Warrior Ethos into IET. Field Manual (FM) 7-0, *Training the Force*, gives the following definition of Warrior Ethos: "Warrior Ethos compels all soldiers to fight through all conditions to victory no matter how long it takes and no matter how much effort is required. It is the soldier's selfless commitment to the nation, mission, unit, and fellow soldiers. It is the professional attitude that inspires every American soldier. Warrior Ethos is grounded in refusal to accept failure. It is developed and sustained through discipline, commitment to the Army values, and pride in the Army's heritage."³

Warrior Ethos is partially defined by the Army as "...a renewed spirit of fight, teamwork, and commitment." Its tenets, "We will never leave a fallen comrade behind," "We will never

quit," "Mission first," and "Every soldier is a warrior"—which are part of the Soldier's Creed—are now at the foreground of training at every level in the Army. These tenets—often hidden in the background of day-to-day occupational skill duties—are now first priority for soldiers. Warrior Ethos is part of increasing the quality of our soldiers in IET and across the force.

The Soldier's Creed has been redesigned and has become more than a catchphrase at Fort Leonard Wood, Missouri. It is painted on dining facility walls, hung in offices and barracks, included in PowerPoint® presentations, and recited during inspections and graduations. It transcends IET boundaries into the leadership of the brigade. In addition, the Soldier's Creed is anchored around the Warrior Ethos, which states that we are soldiers first.

*"The Warrior Ethos is about being a Soldier first; always a Soldier. It's not about being an infantryman; it's about being a Soldier. It's about Soldiers who can fight and win, who can close with and destroy the enemy, who can engage and kill an enemy in close combat if they have to."*⁴

Although the clear focus within TRADOC is on training and developing combat-ready warriors, the Engineer Regiment will not be gaining soldiers less proficient in their technical skills. Instead, the Regiment can expect to receive engineers—regardless of military occupational specialty (MOS)—from the training base that are just as technically proficient and better prepared for combat operations than their predecessors of

The Soldier's Creed

I am an American Soldier.

I am a Warrior and a member of a team.

I serve the people of the United States and live the Army Values.

**WARRIOR
ETHOS**

I will always place the mission first.

I will never accept defeat.

I will never quit.

I will never leave a fallen comrade.

I am disciplined, physically and mentally tough, trained and proficient in my Warrior tasks and drills.

I always maintain my arms, my equipment and myself.

I am an expert and I am a professional.

I stand ready to deploy, engage, and destroy the enemies of the United States of America in close combat.

I am a guardian of freedom and the American way of life.

I am an American Soldier.



just the past several months. Specifically, future graduates of IET will be—

- More experienced with US weapons (M16s, MK19s, M2s, M240Bs, and the Engagement Skills Trainer [EST] 2000).
- Physically fit, courtesy of the standardized physical fitness program.
- Trained to Level 1 in combatives.
- More proficient in detecting explosive hazards (EH).
- More proficient in operating in urban and complex terrain.
- More experienced in a field training environment.
- More experienced with convoy live-fire procedures.
- More confident and committed to the ideals espoused in the Soldier's Creed.

In addition, other initiatives in training will transform IET as shown in the table below.

Changes in Engineer IET

OSUT (MOS 21B/21C)

Task Force Sapper and Bridger transforms volunteers into American soldiers, instilled with the Warrior Ethos, through rigorous and relevant training in basic combat and engineer skills, producing disciplined and MOS-qualified 21B combat engineers and 21C bridge crewmembers who are prepared for combat.

As part of OSUT, combat engineers will train the WT&D during the execution of the 14-week POI, without any additional time spent at the training base. As a result, there is a significant increase in training in the field; on checkpoint, urban, convoy, and patrol operations; on combatives; and on land navigation. The training units will also initiate a weapons immersion program, with the overall intent of increasing the familiarity, accountability, and comfort level of IET soldiers with their assigned weapons. To the greatest extent possible, soldiers will carry their weapons with them at all times.

EH training is also taught to all engineer soldiers. The primary focus of this training is on detection by visual means of both improvised explosive devices (IEDs) and unexploded

ordnance (UXO). During the conduct of this training, soldiers perform an engineer reconnaissance during IED lane training, followed with reinforcement training during a field training exercise (FTX). As part of this training, the soldiers also execute reaction to attack, including casualty evacuation.

All MOS 21B OSUT soldiers also receive 3 days of urban breaching training, which includes three breaching techniques. The *manual technique* prepares soldiers to breach doors, windows, and walls. The *ballistic technique* involves using a shotgun to breach a door. The *explosive technique* uses the silhouette charge, C-charge, water charge, and window charge.

In addition to the WT&D, the 21C POI will continue to improve in the near future. With the fielding of new equipment, new training development products must be continually produced. As an example, all 21C OSUT soldiers will begin training on the dry support bridge by the third quarter of fiscal year 2005. A task site selection board is needed for this course, and the US Army Engineer School plans to conduct a board this fiscal year.

The training highlight for engineer OSUT is the combat engineer field training exercise (CEFTX), which is the culminating event of the course. This exercise is 5 days and 4 nights spent in the field, focused on assessing individual soldier tasks. Training highlights of this event include convoy resupply, movement to contact, security patrols, secure an objective, enter and clear a building, a 4-hour mission-oriented protective posture exercise (MOPPEX), react to contact, react to ambush, avoid ambush, react to indirect fire, react to chemical attack, and other military operations in urban terrain (MOUT) tasks.

Engineer AIT

Task Force Horizontal continuously transforms basic combat training graduates at Fort Leonard Wood and at Panama City Beach, Florida, into technically competent, values-based, teamwork-oriented Career Management Field 21 soldiers (21E heavy construction equipment operator, 21F crane operator, 21J general construction equipment operator, 21G quarrying specialist (Reserve only), 21V concrete and asphalt equipment operator, 21D diver, and 62B construction equipment repairer), who are prepared to contribute on Day One in their first unit of assignment in a contemporary operating environment (COE).

Initial-Entry Training Transformation	
FROM	TO
Graduating soldiers who are ready to join a unit	Graduating soldiers ready to win and survive in combat
Conducting garrison-oriented training	Conducting field-oriented training
Focusing on drill and ceremonies	Focusing on tactical movements and combat drills
Passing the Army Physical Fitness Test	Increasing campaign endurance, combat fitness, and combat drills
Qualifying on the M16 rifle	Employing weapons found in units
Learning soldierization and the Army Values	Learning soldierization, Army Values, and the Warrior Ethos

Task Force Vertical continuously transforms basic combat training graduates at Fort Leonard Wood; Sheppard Air Force Base, Texas; Gulfport, Mississippi; Goodfellow Air Force Base, Texas; and Fort Belvoir, Virginia, into technically competent values-based, teamwork-oriented soldiers (21R interior electrician, 21T technical engineer, 21K plumber, 21W carpentry and masonry specialist, 21M firefighter, 21L lithographer, 21S topographic surveyor, 21U topographic analyst), who are prepared to contribute on Day One in a COE.

Regardless of MOS, all engineer soldiers will receive reinforcement training on the WT&D as an addition to their current POI. In fact, all MOSs—except 21D and 21M—will return to Fort Leonard Wood to conduct this reinforcement training as the culmination of their IET experience. Although extremely important and critical to the success of our soldiers in combat, this initiative presents quite a significant challenge in its execution. Given the multitude of MOSs that must be trained, and the number of engineer soldiers trained on an annual basis, the brigade must conduct an AIT FTX every week, except for the two weeks during Exodus, when troops head home for holiday leave. As mandated by TRADOC, all those MOSs whose courses exceed 6 weeks in length will also requalify on the M16.

In order to execute this training, engineer AIT soldiers will go through Battle-Focused Training (BFT) rather than Common Engineer Training (CET). The resources associated with CET will be transformed in order to execute BFT. Initially, this training will remain at 5 days, but will grow to 8 days by fiscal year 2006. Additionally, to capitalize on their technical training and prepare them for combat operations, soldiers will attend BFT after their MOS technical training. Although soldiers are already executing BFT, most are still doing so before their technical training. However, the transition of BFT to post-technical training began in the second quarter of fiscal year 2005. The goal is to be completely online with this initiative by the start of the next fiscal year.

In addition to M16 requalification, some additional training highlights of BFT include forward operating base procedures, checkpoint operations, vehicle operations focused on IED defeat, urban operations, movement to contact, convoy live fire, crew-served weapons reinforcement, and 48 hours of field training.

As indicated by the training listed above, there are substantial resources being allocated to the training base. In support of the WT&D, numerous forward operating bases, MOUT sites, a convoy live-fire range, and other ranges and training areas are being constructed at Fort Leonard Wood. In addition, the post is receiving new equipment, weapons, and the additional time to train.



Task Force Sapper soldiers conduct MOUT operations during a CEFTX.

As the Warrior Ethos and WT&D continue to spiral in at a rapid pace, Fort Leonard Wood's 1st Engineer Brigade is committed to producing engineer soldiers that are world-class. As the Regiment, we expect you will notice a difference in these men and women who will be joining you. A significant investment is being made to ensure that our IET graduates are ready. As the brigade responsible for their training, we stand ready to take your comments and feedback about our success.



Major Kirkton is the Brigade Operations Officer, 1st Engineer Brigade, Fort Leonard Wood, Missouri. She has had numerous assignments, including Assistant Professor at the United States Military Academy and Chief of Engineer Doctrine, US Army Engineer School, Fort Leonard Wood. She is a graduate of the Command and General Staff Officers Course at Fort Leavenworth, Kansas, and holds a master's in education from the University of Virginia.

Endnotes

¹ Warrior Ethos Web site at <<http://www.tradoc.army.mil/pao/TNSarchives/March04/036504.htm>>.

² General Kevin P. Byrnes, Commanding General, US Army Training and Doctrine Command, June 2004.

³ FM 7-0, *Training the Force*, 22 October 2002.

⁴ General Byrnes, February 2004.



TASK FORCE TRAILBLAZER: Providing Assured Mobility

By Major Paul D. Harron

Task Force Trailblazer¹ is an adaptation of a long-standing engineer mission—providing assured mobility. During Operation Iraqi Freedom, the primary obstacle to assured mobility for US and coalition forces is the improvised explosive device (IED). IEDs are improvised mines, and Trailblazer performs nonstandard minefield clearance.

The Task Force Trailblazer mission was originally conducted by the 14th Engineer Battalion (Corps)(Wheeled), a multicomponent battalion with three Active Army companies and one Army National Guard company. The battalion passed on its tactics, techniques, and procedures (TTP) during a relief in place with the 141st Engineer Battalion (Corps)(Wheeled), North Dakota Army National Guard, in April 2004. In Iraq, the 141st is attached to the 264th Engineer Group, Wisconsin National Guard, which directly supports the 1st Infantry Division.

Mission

Trailblazer involves clearance and sanitation of main and alternate supply routes to provide assured mobility for 1st Infantry Division elements.

Clearance, which is observing and removing possible IEDs and unexploded ordnance (UXO), is performed on both sides of the road and the median, if applicable. When specialized equipment is used, it covers 4 meters of the roadway. A foot patrol covers as much as 300 meters of the roadway.

Sanitation involves identifying and eliminating potential IED emplacement sites and hide sites used by anti-Iraqi forces. There are two types of sanitation: hasty and deliberate. *Hasty sanitation* is the removal of debris and trash within 5 meters of the roadway to reduce the ability to disguise an IED. *Deliberate sanitation* is a more extensive effort that focuses on the area within 300 meters of the roadway. Conducting this



Charlie Company, 141st Engineer Battalion, conducts a patrol near Baqubah, Iraq.

type of sanitation denies the enemy the ability to conduct attacks from well-disguised positions. Deliberate sanitation in this type of environment requires a combined arms effort; it is necessary to have maneuver support to provide security as sanitation operations are conducted. The enemy, just like in a traditional battlefield, looks for favorable terrain. In this environment, that means terrain that allows him a tactical advantage for the emplacement of IEDs and the ability to hide and detonate them or provide an ambush overwatch.

Intelligence Support

Upon arrival in theater, the 141st prepared to receive its equipment, while an advance party traveled to Forward Observation Base Speicher to begin the relief in place. The battalion's S2 and S3 traveled north to coordinate this process and familiarize themselves with the terrain. During this initial visit, the unit realized the critical nature of intelligence in the assured mobility fight—so critical that the S2 remained in Iraq to continue to learn mission, enemy, terrain, troops, time available, and civilian consideration (METT-TC) for Trailblazer.

As in any operation, intelligence plays an important role in determining the task organization. It became evident that enemy actions and terrain would drive the battalion's efforts to reduce and eliminate IEDs within its area of operations. Using METT-TC analysis, named areas of interest (NAIs) were established that allowed Trailblazer patrols to focus their efforts. The contemporary operating environment (COE) teaches that the

enemy is always learning and changing. This requires constant reevaluation and adjustment of TTP in order to remain effective in the counter-IED fight and keep our soldiers safe.

Anti-Iraqi forces initially surface-emplaced IEDs, which were easy to identify visually. These IEDs were also command-detonated with a visible wire leading to the anti-Iraqi force member with the detonator. As Operation Iraqi Freedom continued, IEDs became more sophisticated. Anti-Iraqi forces started burying IEDs and remotely detonating them. Now the 141st looks for an antenna sticking out of the ground, rather than a round with wires running from it, which makes the task more difficult. As this TTP developed, an Interim Vehicle-Mounted Mine Detection (IVMMD) System was included in the Trailblazer patrol set. The IVMMD System allowed soldiers a greater level of force protection and the ability to detect mines by more than visual observation. As the enemy changes,



A soldier places charges on UXO found on a Trailblazer patrol.

so does the mission, so the ability to be flexible is critical to success.

The battalion's initial equipment set used high-mobility multipurpose wheeled vehicles (HMMWVs) and 5-ton dump trucks, which were effective for identifying IEDs. Additionally, M1114 up-armor HMMWVs and add-on armor kits for HMMWVs improved safety while conducting route clearance operations.

Combined Arms Effort

Task Force Trailblazer truly needs to be a combined arms effort. Due to the constant presence required on the roadways to be effective, it is critical to have good relationships with the task forces that own the terrain, as well as with air assets, if they are available.

One of the most important lessons the 141st learned from the 14th was the importance of face-to-face coordination with the landowning task forces. While conducting Trailblazer, there were many occasions when it was necessary to call a task force to assist a Trailblazer patrol with quick-reaction forces (QRFs). Coordination ahead of time was essential.

During Operation Iraqi Freedom, explosive ordnance disposal (EOD) teams, who dispose of the IEDs, were located with the task forces. The task force QRF is responsible for escorting the EOD teams to the site. To reduce the possibility

of fratricide, the task force must know that Trailblazer is in its battlespace.

Another consideration in the combined arms fight is the need for mechanized and armored support for our patrols. By integrating these assets into patrols, it is possible to take a more active stance when engaged by the enemy. There were also several occasions when Trailblazer relied on air QRFs to support operations when Trailblazer elements were attacked.

Conclusion

As we enter the next phases of Operation Iraqi Freedom, there will be several changes in Task Force Trailblazer operations. The most notable is that the task force is beginning to train Iraqi security forces to conduct route clearance operations. Initially, it includes joint patrols to ensure their capability and safety. As Iraqi forces become more confident, it is likely that the Trailblazer mission will expand to include patrols by Iraqi forces on their own. There are many hurdles on the way to making this transition, but the goal is a free Iraq, capable of maintaining democracy. To achieve this goal, the Iraqi people must take ownership and pride in their own country.

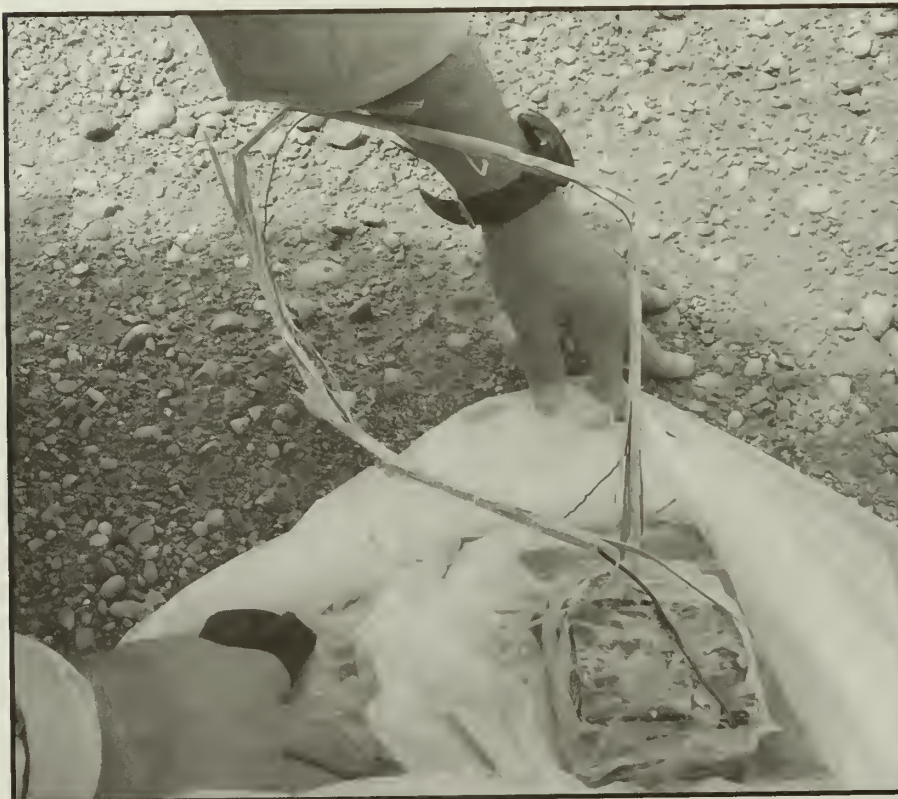


Major Harron is the intelligence officer for the 141st Engineer Battalion, deployed to Iraq in February 2004. His past assignments include battalion S2, air defense artillery platoon leader, executive officer, communications officer, and S4. He holds a bachelor's in criminal justice studies from the University of North Dakota.

Endnote

¹Task Force Trailblazer is the brainchild of Colonel Christopher J. Toomey of the 555th Engineer Group—now the 555th Maneuver Enhancement Brigade (Provisional), 4th Infantry Division (Mechanized). During Operation Iraqi Freedom, Colonel Toomey identified the need for assured mobility due to intelligence and enemy tactics that were being used, primarily the IED.

This article is dedicated to four engineer soldiers who lost their lives while conducting the Task Force Trailblazer mission. They are Specialist Phil Brown, Specialist James Holmes, Staff Sergeant Lance Koenig, and Specialist Cody Wentz.



A soldier from Bravo Company, 141st Engineer Battalion, carefully handles a remote detonator from an IED.

OFFICER PROFESSIONAL DEVELOPMENT



By Chief Warrant Officer 4 Frederick Kerber

"The Corps of Engineers provides the Army and the nation with officers trained and experienced in providing essential engineer support in many different forms. Engineer officers perform missions that span the entire military and civil engineering spectrum while serving our Army and nation in war and peace. Engineer officers should strive to obtain and excel in the tough assignments; this is the fundamental tenant of successful career progression in the transforming Engineer Regiment of the 21st century."

This quote from the new version of Department of the Army (DA) Pamphlet (Pam) 600-3, *Officer Professional Development and Career Management* (tentatively scheduled to be published in March 2005), first paragraph of Chapter 16, provides a great overview for our new engineer officers. Branch qualification is no longer used for the professional development of officers. The Army Chief of Staff did not like the "lily-pad" ideology to success and wants skills and experiences—rather than assignments—to drive professional development. Officers must take a commonsense approach to their own professional development.

Under the new DA Pam 600-3, three professional development tracks have been established for engineer officers:

- **Tactical Command Professional Development Progress.** Typical assignments start in sapper and Stryker companies, with follow-on assignments for majors, lieutenant colonels, and colonels being unit of action (UA) engineers, UA/maneuver enhancement (ME)/unit of employment-tactical (UEX) plans engineers, brigade troop battalion commanders, UEX commanders, and ME brigade commanders.
- **US Army Corps of Engineers® (USACE) Command Professional Development Progress.** Typical assignments start in modular combat engineer commands, vertical and horizontal companies, and battalion and brigade staffs, with follow-on assignments for majors, lieutenant colonels, and colonels being deputy district engineers and district commanders.
- **Nonspecific and Command Professional Development Progress.** Typical assignments are in the US Army Recruiting Command (USAREC) and training commands, with follow-on assignments for majors, lieutenant colonels,

and colonels being engineer brigade staffs, S3s/executive officers, engineer battalion commanders, garrison commanders, unit of employment-operational (UEY) plans/operations engineers, brigade commanders, and district commanders.

The new version of DA Pam 600-3 will include warrant officers, who are undergoing an education and training redesign with the integration of the Warrant Officer Educational System (WOES) into the Officer Educational System (OES). Currently, the US Army Engineer School's Directorate of Training and Leader Development (DOTLD) is conducting an analysis of "integration," where the term integration is as follows:

- **Integrated Training.** The environment (classroom) is the same, and terminal learning objectives (TLOs) are the same.
- **Shared Training.** The environment is shared, but TLOs are different.
- **Shared Curriculum Training.** The environment is not shared, but TLOs are the same.
- **Warrant Officer-Specific Training.** The environment and TLOs are completely different and separated.

Engineer warrant officers are not striving to be commissioned officers or limited duty officers but will continue to be the Army's technicians.



Chief Warrant Officer 4 Kerber is the Warrant Officer Coordinator and Chief Warrant Officer of the Branch (CWOB) in the Engineer Personnel Proponency Office, US Army Engineer School, Fort Leonard Wood, Missouri. He has also served in combat engineer battalions and combat support hospitals. He has more than 30 years of active federal service, with 22 of them as an engineer warrant officer.

Personnel Notes

ENLISTED CAREER PROGRESSION

By Sergeant First Class David Hatch

The US Army Engineer School's Engineer Personnel Proponency Office recently completed a draft revision of Department of the Army (DA) Pamphlet (Pam) 600-25, *US Army Noncommissioned Officer Professional Development Guide*, which is being reviewed at the US Army Human Resources Command (HRC). Prior to fiscal year 2005, engineer military occupational specialties (MOSs) were separated into three career management fields (CMFs):

- CMF 12, Combat Engineering
- CMF 51, General Engineering
- CMF 81, Topographic Engineering

Information on these CMFs was further spread through three chapters in DA Pam 600-25. With the consolidation of all engineer MOSs into CMF 21, there are still three distinct categories within the engineer field—combat engineering, general engineering, and topographic engineering—but they are now in one CMF for ease of management. Information on all Army engineer MOSs will be located in one chapter in the revised DA Pam 600-25.

Additional revisions have linked each engineer MOS and its duty description from DA Pam 611-21, *Military Occupational Classification and Structure*, to DA Pam 600-25. The major duties and responsibilities of each MOS and grade are outlined and a list of professional reading is suggested for each skill level, since some reading may not be appropriate for all skill levels. These revisions will provide soldiers and noncommissioned officers additional direction, guidance, and assistance in managing their professional development.

A career model for each MOS, such as the 21B combat engineer model in the figure on page 27, has been included in the draft revision of DA Pam 600-25. The model shows typical career progression and authorized duty titles and grade, according to DA Pam 611-21. The career model will allow soldiers to track their individual progression to see where they are and where they should be at any given time in their career.

The duty positions and titles found in the career model are linked directly to senior noncommissioned officer promotions. Recommendations from the Engineer Personnel Proponency Office are provided to board members concerning leadership

and career-enhancing positions, as well as recommended time in leadership positions.

As the Engineer Regiment transforms to modularity, soldiers in the Regiment must also transform. Soldier transformation is taking place in the form of several ongoing personnel actions within the Engineer Personnel Proponency Office. These include the creation of an additional skill identifier (ASI) for combat engineer soldiers who have successfully qualified as explosive ordnance clearance agents (EOCA). An EOCA is a soldier who has a limited ability to dispose of certain types of unexploded ordnance (UXO). This skill will enhance the ability of engineers to influence mobility on the battlefield, freeing explosive ordnance disposal (EOD) personnel to concentrate on high-payoff targets and further bridge the gap between the engineer and EOD communities. (See article on page 40.)

Consolidation of MOSs 21U topographic analyst and 21L lithographer is in the works, with the end result being an ASI to designate personnel qualified as lithographers. Also ongoing is the consolidation of MOSs 21T technical engineer specialist and 21S geodetic surveyor, resulting in the deletion of MOS 21S and creating a 21T multifunctional surveyor. MOSs 21F crane operator and 21J general construction equipment operator will consolidate in fiscal year 2006, resulting in an MOS 21J general construction equipment operator. Another consolidation under consideration is the combination of MOS 21J with 21E heavy construction equipment operator to create a 21E construction equipment operator. This consolidation is being reviewed by the Engineer School and the US Army Training and Doctrine Command to resolve funding issues.

The Engineer Regiment is changing daily, with the implementation of the new engineer force structure. The consolidations that are currently in progress will greatly enhance the capabilities of the Engineer Regiment for current and future operations. 

Sergeant First Class Hatch is an engineer career manager in the Engineer Personnel Proponency Office, US Army Engineer School, Fort Leonard Wood, Missouri. Previous assignments include a tour in Germany and three tours in Korea. He has held numerous leadership and instructor positions, which include platoon sergeant at Fort Polk, Louisiana, and in Korea.



Years	1-2 Years	3-5 Years	6-10 Years	11-15 Years	16-30 Years
Rank	PVT-SPC	SGT	SSG	SFC	MSG/SGM See MOS 21Z
Operational Domain	Combat Engineer	Team Leader	Squad Leader	Platoon Sergeant	
	Vehicle Operator	AVLB Commander	Section Sergeant	Opns/Asst Opns Sergeant	
	Heavy Vehicle Operator	ACE Operator	Drill Sergeant / Recruiter		
	Track Vehicle Operator	Wolverine Commander	Instructor / Writer		
	Armored Combat Earthmover (ACE) Operator		Observer-Controller / Active-Reserve		
	Wolverine Operator		M/CM/S NCO	Intel SGT/Construction Inspector	
Professional Military Education		Primary Leadership Development Course (PLDC)	Deception NCO	Project Management NCO	
			Recon SGT / Construction Foreman	Career Manager	
Functional Training				Master Gunner	
				Engineer Safety LNO	
				Asst Team Leader	
				Detachment SGT	
			Basic Noncommissioned Officer Course (BNCO)	Advanced Noncommissioned Officer Course (ANCO)	
	Advanced Individual Training				
Self-Development Domain		Air Assault / Airborne / Jump Master / Pathfinder / Sapper / Ranger	Drill Sergeant School		
			US Army Recruiting and Retention School		
		Urban Mobility Breaching Course			
		Combat Engineer Heavy Track (B6)	Battle Staff Operations (2S)		
			Master Fitness Trainer (P5)		
Links	FAST	Civilian Degree Program	Complete Associate Degree Program	Begin Bachelor's Degree Program	
	Civilian Degree Program				
Promotion		< http://www.soc.aascu.org/socad/ACD.html >		< http://www.soc.aascu.org/socad/ACD.html >	
		< http://www.soc.aascu.org/socad/Default.html >			
	PV2 - 6 mo time in service	PZ - 36 mo time in service/8 mo time in grade	PZ - 64 mo time in service/10 mo time in grade	6 Years time in service minimum	
	PFC - 12 mo time in service	SZ - 18 mo time in service/6 mo time in grade	SZ - 48 mo time in service/1 mo time in grade	PZ - 35 mo	
Retention Control Point	SPC-24 mo time in service/6 mo time in grade			SZ - 23 mo	
	3 Years	15 Years SGT(P) 20 Years	22 Years SSG(P) 24 Years	24 Years SFC(P) 26 Years	

Legend:

AVL B = armored-vehicle-launched bridge
 FAST = Functional Academic Skills Training
 M/CM/S = mobility/countermobility/survivability
 mo = months
 PZ = primary zone
 SZ = secondary zone

Proposed MOS 21B Career Model

IED Defeat:

Observations From the National Training Center

By Lieutenant Colonel Thomas H. Magness

There is no silver bullet. Try as we might, there is no single tool capable of defeating the use of improvised explosive devices (IEDs) on the battlefield—whether in Iraq, Afghanistan, or at the National Training Center (NTC). No amount of armor plating or distribution of electronic countermeasure (ECM) devices will guarantee the safety of our soldiers and the freedom of maneuver of our forces. Old school thinking assumes that the enemy will be successful and friendly forces must be prepared to react—at the point of blast.

Leaders at all echelons who seek *proactive* IED defeat solutions should consider the following nine observations. Based on trends at NTC and framed by the fundamentals of assured mobility, they are a combination of those things that engineer units and leaders (as part of combined arms teams) do well, and must sustain—and do not do well, and must improve. They all carry with them a consistent theme: skills and tools. These are the elements that make engineer soldiers unique. They are the special “brand” that are applied across the entire combat team by those whose principal focus from sunup to sundown is enabling mobility in concert with maneuver. They produce a mentality that resonates throughout the entire formation: *We are all soldiers. We are not all infantry. We are uniquely skilled and equipped for some specific, challenging missions, to include addressing the No. 1 threat to the mobility of the force—IEDs. We are combat engineer sappers!*

Predict. Predict actions and circumstances that could affect the ability of the force to maintain momentum.

Observation No. 1: Implement rigorous pattern and terrain analysis.

Databases of IED events must be linked vertically and horizontally. They must be searchable and queryable to facilitate analysis at the tactical level. This is not something that is reserved for some theater-level intelligence cell. The need for real-time intelligence and enemy patterns requires tactical-level information management systems and leaders comfortable with the exploitation of this analysis. There is clearly more we can and must know about the enemy and how he fights. Tactical leaders must demand accurate and consistent reporting from every IED incident, as well as every route reconnaissance and clearance mission. Pattern analysis is only as good as the data that feeds it. At a minimum, tactical reports must include the location; date/time; friendly target; IED components; initiation system; friendly/enemy battle damage

assessment (BDA); friendly/enemy actions; names, descriptions, and addresses of suspected or known insurgents; and observations and key lessons learned.

Our terrain analysis must be focused to facilitate not only “seeing the terrain” but also “seeing the enemy (who is using IEDs)...on the terrain.” Our own observations at NTC indicate an erosion of terrain visualization skills and of confidence in our visualization tools. Soldiers and leaders must be able to use tools such as TerraBase, FalconView™, Digital Topographic Support System (DTSS), and Urban Tactical Planner™ (UTP) to identify terrain that favors the enemy’s use of IEDs. They must be able to import imagery, video, and digital products to facilitate real-time “change detection” (the ability to identify differences and possible IED indicators along or adjacent to a route). Topographic products must allow the commander to see the enemy’s patterns of IED employment on the terrain that favors their use. As new tools are developed for urban terrain visualization, engineers must be the terrain visualization masters. (See articles on pages 11 and 14.)

Observation No. 2: Conduct postblast reconnaissance.

Too often our IED event databases lack the necessary information to facilitate detailed analysis. We cannot miss the critical step of postevent analysis. Determine the necessary components of postblast reconnaissance and train our engineer soldiers, if not the entire combat formation, on the fundamentals of this requirement. This is evidence collection—a technical reconnaissance task, not higher-level analysis such as that conducted by an explosive ordnance disposal (EOD) technician. Units regularly leave the blast site and assume that the already-stretched EOD assets cannot accomplish this low-priority task. There is much to be gained from each event if a trained analyst has access to digital photographs, measurements, residue, detailed reports, and patrol backbriefs. Again, the output from our enemy pattern analysis is only as good as the input.

Detect. Detect early indicators of impediments to battlefield mobility, and identify solutions through the use of intelligence, surveillance, and reconnaissance (ISR) assets.

Observation No. 3: Follow the rules of Reconnaissance and Surveillance (R&S) 101.

Pattern and terrain analysis, along with other intelligence products and data, must result in a focused tactical R&S plan. This is no change from the way we have conducted tactical operations for years. Areas in which the terrain favors the

enemy's use of IEDs, and that are consistent with previous patterns, become named areas of interest (NAIs). Observers (scouts, patrols, unmanned aerial vehicles [UAVs], and aerial observers) must be specifically tasked to answer IED-specific priority intelligence requirements (PIR). Command posts manage the execution of this focused R&S plan and provide vertical and horizontal situational awareness of the results. Similarly focused targeting processes must result in PIR/NAI/observer linkages tied to proactive reconnaissance of IED recruiters, trainers, suppliers, financiers, bomb makers, and leaders in the IED "food chain." We do not need new doctrine in this area—we need the focus and execution embraced by our current field manuals.

Engineer staff officers bring focus to this process. Engineer leaders leverage all of the reconnaissance tools and special equipment within their respective organizations (see Figure 1). Terrain visualization products are developed to facilitate the proposed observer plan. Patrol debriefs and other intelligence from subordinate units conducting route reconnaissance provide updates to the R&S plan as it is developed. The technical analysis of IED patterns; bomb making material; initiating systems; and enemy tactics, techniques, and procedures (TTP) help focus NAIs and observers at points far "left of blast."

Observation No. 4: Conduct focused route reconnaissance.

Each combined arms formation must have dedicated units in which unique skills and tools for the reconnaissance task reside. These units should be experts in the various reconnaissance and react-to-contact battle drills associated with this mission. They must know their route intimately from multiple repetitions of disciplined travel. They must be "human change detectors." They are drilled in the ways of the enemy and regularly updated on enemy patterns and emergent friendly

and enemy TTP. These units are the first to gain the skills associated with the Explosives Ordnance Control Agent (EOCA) Course that spans the gap between combat units and EOD and are prepared to respond to some battlefield explosive threats. These units are the first to receive the equipment and associated training to conduct this focused task to include ECM devices, robotics, and mobile counter-IED technologies. These skills and tools cannot be randomly distributed across the formation. Nor can this critical reconnaissance mission be randomly assigned to units that lack the skills and tools for it. Engineer reconnaissance and clearance units and sapper organizations focused on these tasks must be formed, focused, resourced, and trained now.

Prevent. Prevent potential impediments to maneuver from affecting the battlefield mobility of the force by acting early.

Observation No. 5: Focus your targeting.

The most effective way to prevent the effects of IEDs on friendly forces is to deny the enemy the opportunity to ever get an IED on the ground. Be proactive. Focus the targeting process on insurgents and enemy operatives associated with any link in the IED chain (see Figure 2, page 30). Use terrain and pattern analysis tools and products to focus operations to deny the enemy the use of key terrain to his advantage. Combined arms organizations must own their respective battlespace. Do not cede it back to the enemy.

Engineers must be engaged in the targeting process, especially at the brigade and task force levels. Masters of the terrain help planners visualize key areas for R&S. Engineer leaders bring a detailed understanding of key routes from repetitive reconnaissance by subordinate units. They also leverage a "family" relationship with the EOD community and bring an understanding of technical explosives issues to the



Figure 1. Conducting route clearance in a Buffalo mine-protected vehicle

targeting process, as well as current and projected EOD unit capabilities.

At NTC, the No. 1 predictor of the ability to prevent the enemy use of IEDs is the quality and depth of relationships within the communities of the friendly unit area of operation. Human intelligence networks will identify insurgents and the locations of their bomb making supplies. Local leaders will root out troublemakers within their towns and villages. Build and maintain efficient, two-way communication channels, and provide incentives for informants. Include these key relationship elements in the lethal and nonlethal targeting processes.

Consider the following proactive suggestions for preventing IED emplacement:

- Develop good relationships with the local populace.
- Coordinate with local police; conduct joint patrols.
- Use patrols, observation points, and checkpoints; deny access to key terrain.
- Use counter-IED-ambush teams and scout-sniper teams.
- Reduce availability of bomb making materials.
- Clean routes of trash, brush, vegetation, and abandoned vehicles.

Avoid. Avoid detected impediments to battlefield mobility of the force, if prevention fails.

Observation No. 6: Develop and maintain information management systems.

Our ability to see first, understand first, act first, and finish decisively is directly related to our ability to develop and

maintain information management systems. The technology exists now to provide critical mobility information (route status, known and suspected IED locations, and enemy IED templates based on terrain and pattern analysis) as input into the common operational picture (COP). The Army Battle Command System (ABCS), when fully leveraged, gives commanders and leaders the ability to provide relevant, near-real-time information about the battlefield. Engineer leaders must consider the following:

- Do we have staff engineers at *all* task force and higher command posts to facilitate vertical and horizontal information flow?
- Do we have clearly understood reporting requirements and a headquarters empowered to demand timely and accurate reports from (maneuver and engineer) subordinate units?
- Do we have a common understanding of route status assessment criteria?
- Do route status changes result in action by maneuver units to confirm, deny, or mitigate the impediment to friendly maneuver?
- Are route statuses serving as input to the targeting and planning processes?
- How do we alert friendly units to the change of the mobility picture? Do we have redundant digital and analog means to alert all friendly units—to include adjacent and higher-echelon units operating in our battlespace?

Neutralize. Neutralize, reduce, or overcome (breach) impediments to battlefield mobility that cannot be prevented or avoided.

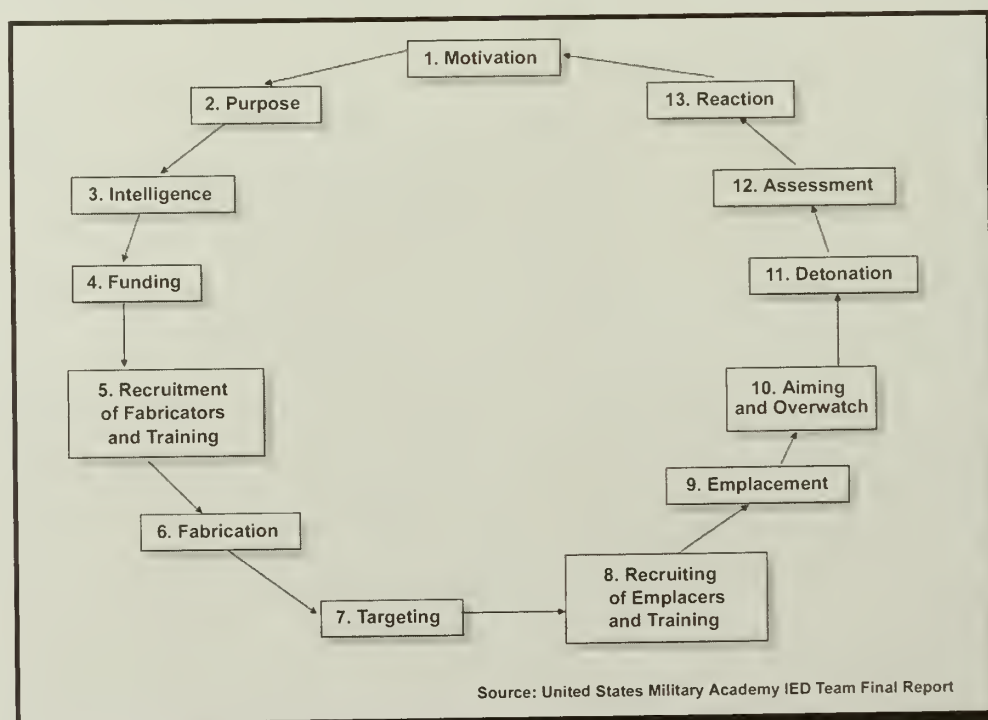


Figure 2. Components of an IED life cycle

Observation No. 7: Integrate EOD units into brigade combat team operations.

Maneuver units continue to be challenged with the integration of EOD units. For most organizations, whether deploying to NTC or into theater, the first opportunity to work with these professionals is upon arrival. Engineer leaders, as the closest “relative” to an explosives technician with whom most maneuver units will habitually train and work, must take some degree of ownership of EOD and its associated tactical mobility implications. Whether a combat engineer battalion or brigade troop battalion, there must be a node resourced and trained to be the socket into which units like EOD can plug. Engineer units and leaders must be comfortable operating with EOD units and accounting for their unique battlefield requirements.

Effective EOD integration requires a dedicated security element. EOD personnel cannot secure themselves during tactical employment for an IED event. The security force must be sufficiently briefed on known or suspected threats, well-rehearsed on all react-to-contact and IED-event battle drills, and appropriately resourced with firepower and counter-IED tools for this critical mission. Units that approach the security requirement as a low priority or assign random units often regret having done so. Maneuver units are forced to “wait for EOD”—painful words for friendly forces who themselves become vulnerable in likely enemy target or ambush areas.

Protect. Protect against enemy countermobility effects.

Observation No. 8: Protect moving forces versus a stationary threat.

At NTC, this is where we are seeing units having measurable success in countering the enemy’s intentions for his use of IEDs. Disciplined soldiers, realistic training, and the hard work of our noncommissioned officer corps are proving daily the value of these tactical considerations to protect the force:

- Treat every movement as a combat patrol. Prepare and rehearse accordingly.
- Be deliberate about the positioning of key systems and vulnerable team members within the formation.
- Maintain low profiles in vehicles and appropriate vehicle spacing within moving formations.
- Use all available protective gear, to include body armor, eye and hearing protection, and seat belts.
- Rehearse, rehearse, and rehearse. Prepare to react to all forms of contact. Ensure that all members of the patrol understand the mission, the threat, and all contingency plans. Assume nothing.
- Ensure that load plans are standardized and enforced. Tie down all loose equipment.
- Communicate—before, during, and after each combat patrol. Identify redundant means of communication along routes and within urban population centers.

- Identify all echelons of medical support available to the combat patrol. Provide combat lifesavers and medical personnel with the best available medical gear. Check and replenish all medical stocks immediately upon returning from each trip “outside the wire.”

Observation No. 9: Protect stationary personnel and facilities versus a moving threat.

A desperate enemy is increasingly leveraging the vehicle-borne improvised explosive device (VBIED) against coalition forces. Friendly units must continue to maintain vigilance against a mobile enemy weapon that can be experienced anywhere on the battlefield. Key tactical considerations include standoff while conducting operations such as patrols and checkpoints and heightened situational awareness built on known VBIED indicators and enemy pattern analysis. Soldier discipline and the items mentioned above for combat patrols will also protect soldiers on the battlefield against a mobile threat.

Recent battlefield lessons have also been a classic opportunity to showcase “One Regiment, One Fight” and leverage the knowledge and expertise of the US Army Corps of Engineers® to protect facilities and equipment. Personnel at the Engineer Research and Development Center (ERDC) have done some terrific work to develop plans and specifications for hardening entry control points and vulnerable facilities. They have also tested a variety of materiel solutions, many of which are now being used to protect soldiers and their equipment. Fundamental considerations of material strength, explosive resistance, flame retardants, access control, standoff, and hardening—areas of expertise in various centers and cells across the Engineer Regiment—are proving daily their importance in protecting the force.

Summary

Observations at NTC confirm that successful units take a holistic, proactive, broad-based approach to IED defeat solutions based on the fundamentals of assured mobility. And while the various responsibilities nested within the fundamentals of predict, detect, prevent, avoid, neutralize, and protect are distributed across the combined arms team, it is the engineer—the Chief of Mobility—who pulls it all together and employs the tools and technologies, appropriately focused, to defeat the IED threat. There truly is no silver bullet, but there IS a silver castle! *Train the Force!*



Lieutenant Colonel Magness is the Senior Engineer Trainer (Sidewinder 07) at the National Training Center, Fort Irwin, California. Prior to this assignment, he served as district commander for the Detroit District, US Army Corps of Engineers. He is a graduate of the United States Military Academy and the Command and General Staff College. He holds a master's from the University of Texas and is a licensed professional engineer in Virginia.

Note: This article reflects the personal opinions of the author and are based entirely on lessons learned at NTC.

Countering IEDs and Explosive Hazards

By Mr. Robert G. Baker and Mr. Dorian V. D'Aria

As revealed in history, our military becomes increasingly better and more agile with each battle. Ours is the most dynamic and powerful country on this earth, because our military is willing to adapt and evolve. Change and advances in technology enable our country to continue to prosper and take the lead in the Global War on Terrorism. Since the Countermine Task Force was formed in 2001 (by the direction of the Commanding General, US Army Training and Doctrine Command [TRADOC]), the US Army Engineer School has been instrumental in developing the skills and tools needed to enable mobility through urban and complex terrain. This was accomplished while negating explosive hazards (EH) such as mines, booby traps, unexploded ordnance (UXO), and improvised explosive devices (IEDs). This article describes current initiatives and contains an overview of the collaborative agencies working to combat this threat.

The Countermine/Counter Booby Trap Center, which was created in January 2002, changed its name to the Counter Explosive Hazards Center (CEHC) in April 2004. The CEHC was formally recognized and approved by Headquarters, Department of the Army, on 18 November 2004 to function as the US Army integrator for all countermeasures involving EH (including mines, IEDs, and other EH that threaten US and allied forces). A key element is the prediction, detection, avoidance, and neutralization of EH, so commanders can maneuver unencumbered through urban and complex terrain.



The CEHC provides expertise not provided elsewhere in the Army's institutional training base. Additionally, the CEHC bridges the gap between emerging warfighter requirements and institutionalized training. Based on comments and mission analysis from the field, the CEHC develops new or improved capabilities, as well as the requisite tools to equip our soldiers, to counter EH on the battlefield.

The CEHC conducts explosive hazards awareness training (EHAT) to deploying forces, develops EH countermeasures, conducts new equipment training for commercial off-the-shelf equipment, produces training aids and programs of instruction, and assists in the identification and fielding of viable countermeasure solutions. In addition, the CEHC develops the intellectual and situational superiority of combat units through handbooks and new tactics, techniques, and procedures (TTP) to Active Army and Reserve Component units, government civilians, contractors, other US services, and allied forces. The CEHC provides eleven courses, which are

used to train approximately 4,000 students annually. Several are train-the-trainer-type courses to empower units to rapidly spread the latest TTP and engineer knowledge. Additionally, it assists with the integration of doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) assessments across the five tenets of IED defeat—predict, detect, prevent, neutralize, and mitigate—that were initially derived from the five fundamentals of assured mobility.

In addition to resident instruction, the CEHC develops exportable countermeasures, which are provided directly to field units for rapid implementation, as well as institutionalized into soldier, noncommissioned officer (NCO), and officer educational programs of instruction, new functional courses, training materials, field manuals, and emerging doctrine. The CEHC's Intelligence and Technology Branch continually searches to identify and anticipate evolving EH threats.

Another area where the CEHC is breaking new ground is in the development and training of counter-terrorist military search techniques. This effort is in response to needs from the field to safely and methodically search for explosive materials and bomb making contraband, plus the requirement to locate and preserve forensic intelligence to crack terrorist infrastructures. The primary focus of this training is to teach the searchers to identify bomb makers and bomb making materials—prior to detonation—and preserve the evidence found.



Figure 1. A man-portable kit contains specialized tools and equipment for search teams.

Based on proven British techniques against terrorists in Northern Ireland, Bosnia, and elsewhere, the CEHC training is designed to provide US forces with the technical skills, doctrinal capability, and tools to safely execute counterterrorist search missions. It has spiraled into a 15-day course with four main objectives: protect potential targets, gain evidence, gain intelligence, and deny enemy resources. During this course, which breaks into two tracks during the middle part of the course—Unit Searcher and Unit Search Advisor—the students undertake a number of practical exercises: in-person, vehicle, area, route, and occupied and unoccupied building searches. Additionally, the search advisors concentrate on the planning cycles that are crucial to ensuring successful search missions. To equip soldiers to perform these tasks, the CEHC has prepared a specialized man-portable search kit, which contains all the tools and equipment search teams require to execute this mission (see Figure 1). The CEHC is continually refining this kit and endeavoring to establish a standardized search kit that would be available through the regular supply system. This particular materiel solution crosses three of the five tenets of IED defeat—predict, detect, and prevent.

The Engineer School and CEHC have championed the establishment of a mine detection dog program and specialized search dog program. This effort led to the establishment of the 67th Engineer Detachment (Mine Dog), part of the 577th Engineer Battalion, 1st Engineer Brigade, Fort Leonard Wood, Missouri—and the creation of the “K9” additional skill identifier (ASI) for engineer soldiers trained as mine detection dog handlers. The specialized search dog program uses nonaggressive explosive detection dogs, which operate off-leash to search buildings, routes, vehicles, or other venues for explosive devices, weapons, or contraband. The Engineer School has already deployed mine dog and search dog teams into both Iraq and Afghanistan with resounding success. During one specific house search of a suspected vehicle bomb maker, a specialized search dog alerted on the explosive scent off an automobile starter located in the suspect’s garage. At the conclusion of the investigation, it was revealed that the suspect had bomb residue on his hands. He had transferred the residue to the starter while removing it from his car, after completing another project—making a bomb.

The CEHC also developed the doctrine and training for the Mine and

Explosive Ordnance Information Coordination Center (MEOICC) in Iraq. This is the US military’s first effort to develop a standardized doctrine, training, and organizational structure to track explosive threats in an area of responsibility. The MEOICC is our military counterpart to the national or regional Mine Action Centers (MACs) that are used during demining operations within a country. The MEOICC specifically supports military operations and objectives, provides a common operational picture (COP) of EH on the battlefield (using the Tactical Minefield Database [TMFDB]), and provides an interface with the MAC and nongovernmental organizations operating within the common battlespace.

The TMFDB is an automated tracking system to record, geographically locate, and display all known EH in the Iraq or Afghanistan theaters. This provides a COP for commanders and decision makers, a database for analysis, and maps and overlays to warn of danger areas. It also allows the sharing of information between US military and coalition partners or humanitarian/nation building agencies.

To accommodate all the training that is evolving, the CEHC will develop a state-of-the-art training center to be

completed in fiscal year 2006. The Engineer School's efforts have had congressional support, resulting in the appropriation of \$10.4 million for the construction of a CEHC and \$3.7 million for mine dog kennels to begin in fiscal year 2005. This is Phase I of an \$18 million construction effort to establish a permanent counter-EH training complex. It will provide specialized training areas and classrooms, search villages, a motor park for nonstandard counter-IED/mine equipment, and permanent mine dog facilities. It will also have adequate space for route and area clearance, enhancing the overall realism of the training. Until it is institutionalized throughout the force, operator and maintainer training for nonstandard counterexplosive equipment will be taught at this facility. All the activities will be colocated in one area on Fort Leonard Wood—the Humanitarian Demining Training Center, the 67th Engineer Detachment, and possibly a Department of Defense (DOD) mine dog training academy—which will provide better fusion and integration of the CEHC, forming a Counter Explosive Hazards Center of Excellence.

A major effort has been directed toward fighting the war on IEDs, and the Army was tasked to develop a DOTMLPF-integrated IED defeat strategy. To that end, TRADOC was

designated as the Army's specified proponent for IED defeat, and TRADOC designated the US Army Maneuver Support Center (MANSCEN) as the proponent for IED defeat DOTMLPF integration on 29 September 2004. MANSCEN then directed the CEHC to take the lead on this action and put together a DOTMLPF assessment and action plan, which eventually led to the development of the Integrated Capability Development Team (ICDT). The ICDT is responsible for evaluating capability gaps and ensuring proper vision on emerging countermeasures and institutional success in all efforts.

As part of the combined arms team, CEHC and the Engineer School work with numerous external agencies—such as the Rapid Equipping Force (REF) and the Joint Improvised Explosive Device Defeat (JIEDD) Task Force (TF)—to develop and field innovative counter-IED solutions. In October 2003, the Chief of Staff of the Army directed the formation of a JIEDD TF to orchestrate Army efforts to eliminate IED threats. The CEHC became a member of the advisory committee and works closely with the JIEDD TF. In June 2004, the US Army Central Command (CENTCOM) commander asked the Secretary of Defense for a synchronized DOD response to the IED threat. On 17 July

2004, the Deputy Secretary of Defense established an Army-led joint Integrated Process Team (IPT)—organized around the existing Army JIEDD TF—to focus DOD efforts to defeat the IED threat. The IPT identifies, prioritizes, and resources materiel and nonmateriel solutions in a synchronized response across the services and DOD, in coordination with interagency and international partners. The task force, augmented by joint services staff, continues to accomplish the counter-IED operational mission and provides necessary staff support to the IPT. Working together, CEHC, the Engineer School, and MANSCEN are part of a joint, interagency, and multinational counter-IED effort that integrates intelligence, training, technology, and materiel solutions into a holistic program.

As IED countermeasure solutions are developed by the REF and JIEDD TF, the CEHC helps develop operational TTP, training packages, and other DOTMLPF integration requirements. One system under development that covers a combination of DOTMLPF integrations is called the "Hunter-Killer (see Figure 2)." This system is an enhanced route clearance concept, consisting of mine-protected vehicles

(Continued on page 36)

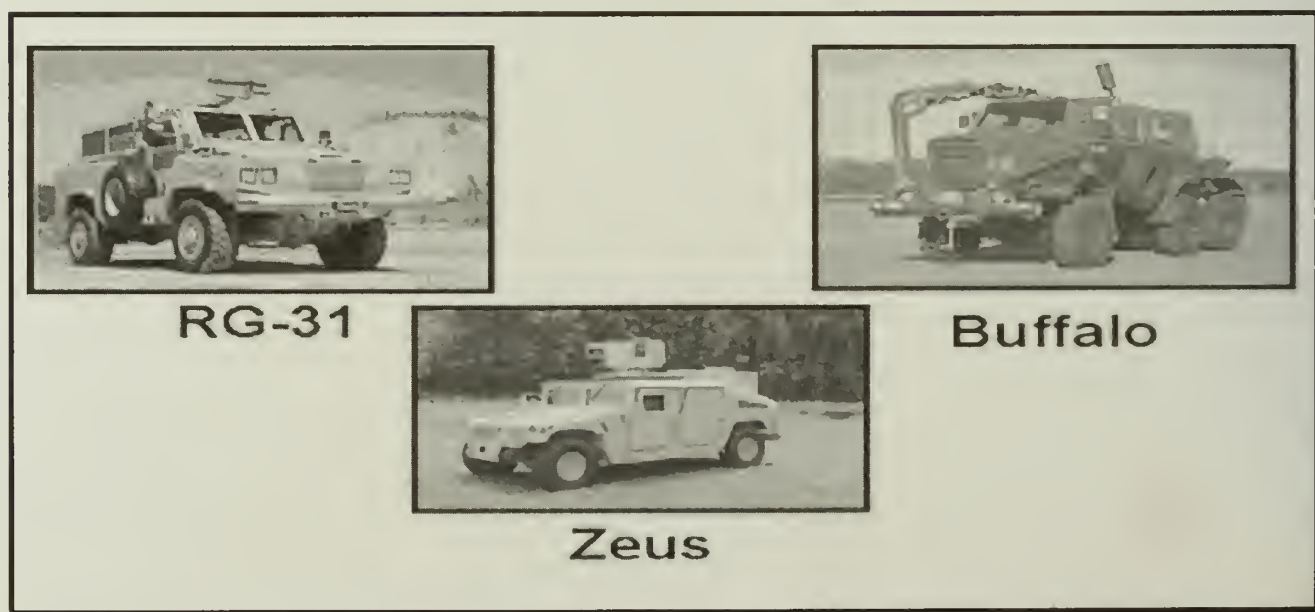


Figure 2. This Hunter-Killer team of vehicles forms an enhanced route clearance system.

Command and Control of Construction Assets in Iraq

By Lieutenant Colonel Jeffrey R. Eckstein

At a time when construction capability within the Engineer Regiment is limited and in high demand, commanders must use their construction assets wisely. This article presents some thoughts on different ways to approach future task organizations.

During Operation Iraqi Freedom, construction assets—consisting of combat heavy battalions and group headquarters—are equally distributed to the divisions and to the corps. Each division has its organic battalions, an attached group with a combat heavy battalion, and a wheeled battalion. At corps level, there are two group headquarters, a combat heavy battalion, a wheeled battalion, a combat support company, and two combat support equipment companies. This allocation results in the inefficient use of forces to accomplish engineer work.

During my experience in corps-level combat heavy units, we worked adjacent to other combat heavy battalion areas, but it was usually at a distance from our base. The converse was also true. Divisional units executed missions adjacent to another base, traveling some distance to the mission site. This created a burden on the unit conducting these remote missions, as well as a command and control problem with coordinating movements, security, and logistics support.

A possible solution for this problem is to allocate construction capability across the theater based on assessed work requirements, to include civil-military projects. A group headquarters could be designated to facilitate



command and control of multiple engineer battalions over a dispersed area. This construction capability would be subordinate to the theater engineer brigade, not the divisions. The boundaries for the group headquarters would not necessarily match the existing divisional and brigade boundaries. A group provides area support to the units within its boundaries, some of which are the division headquarters. This allows the construction capability in the corps to focus on corps priorities and distributing construction capability throughout the corps area of operations.

The corps-level units could execute the large concrete work, road and airfield repairs, and projects that would improve the local Iraqi communities. If a project exceeded a division's capability, it could request corps assistance. The engineer brigade, as directed by the corps, could assign the mission to the group responsible for that area. With the shortage of combat heavy battalions in the force, combat engineer battalions cannot be allowed to ignore simple engineering tasks, such as filling Hesco® bastions, constructing berms, digging trenches, and constructing simple wood

buildings and tent pads. Any type of engineer unit with the proper equipment can execute these missions.

An alternative to retaining the construction assets at corps level is to allocate the units to the divisions based on estimated work in their area of operations. Corps-level missions could then be assigned to the divisions to execute at a higher priority than their own construction missions. This would provide the divisions optimal engineer effort for their integration at the lowest level. It also would allow the corps the flexibility to assign high-priority missions to the unit that owns the battlespace. The risk with this task organization is that the divisions might redirect engineer units to execute nonengineer missions.

Divisions have their organic engineer battalions. Additionally, during Operation Iraqi Freedom, most divisions have a corps wheeled engineer battalion. This gives the division three to four engineer battalions. If properly equipped with power tools and generators, these engineers can provide a majority of the division's construction needs within a base camp or forward operating base. Large projects on a base are typically executed through local contracts or through the US Army Corps of Engineers® area offices. Combat engineers are fully capable of constructing simple wood-framed buildings and tent pads, constructing berms, and filling Hesco bastions. Wheeled engineer battalions have the capability to do those tasks, as well as haul and spread gravel.

An engineer group headquarters can command and control from five to seven task-organized subordinate units. During Operation Iraqi Freedom, most groups control no more than four subordinate units. The two groups subordinate to the theater engineer brigade collectively control three battalions and two separate companies. Additionally, engineer battalions command and control five to seven subordinate companies or detachments. During Operation Iraqi Freedom, the two divisions each have two colonel-level engineer headquarters. This lends itself to stovepiping of engineer effort: One headquarters deals with certain missions, while the other headquarters deals with other missions. One engineer headquarters could synchronize work between all engineer assets within the division and ensure that maximum effort is applied to the division and corps priorities.

Within the Regiment, there is a tendency to think of ourselves as sappers and the other guys. We must realize that there is *one* engineer. Sometimes the focus is on sapper missions, and sometimes it is on construction missions. There are numerous examples from Iraq of the great work engineers are doing outside of their traditional missions while assigned to a specific type of unit. Being flexible enough to execute the mission of another branch is not the road to relevancy. That is the road to manpower reductions in order to buy manning for the other branches. We must always look to execute engineer missions. That is where we add value to the Army. To stay relevant, we must stay focused on *all* engineer missions.

Lieutenant Colonel Eckstein is the commander of the 84th Engineer Battalion (Combat) (Heavy), Schofield Barracks, Hawaii. He has had numerous operational deployments, including Operations Desert Shield and Desert Storm, Somalia, and Operation Iraqi Freedom. He is a graduate of the United States Military Academy and holds a master's in civil engineering from the University of Washington.

("Countering IEDs," continued from page 34)

(the RG-31 and the Buffalo) along with an interim vehicle-mounted mine detector (IVMMD) and supporting vehicles.

Hunter-Killer covers all five of the tenets that the JIEDD TF targets. It primarily detects EH through visual means and by metal detection with the IVMMD. The EH may be interrogated by the Buffalo and destroyed or neutralized by sappers or explosive ordnance disposal (EOD) personnel. Additionally, it can detect certain types of radio-controlled IEDs through the use of sensors and jamming capabilities. Finally, it has the ability to destroy EH at standoff distances, using lasers or remote weapon stations.

Hunter-Killer incorporates the integration of EOD and engineers working in concert on a specific system. During Operation Iraqi Freedom, a gap was identified between EOD and engineer capabilities. (See article on page 40.) The Engineer School and the Ordnance School have been working together to integrate EOD and engineer skills on the battlefield. One such effort is the Explosive Ordnance Reconnaissance Agent (EORA) Course. This course is non-military occupational specialty (MOS)-specific, but has specialized training that enhances the ability to identify, mark, and report EH that will eventually be included in route clearance platoons of clearance companies.

The next level in the EH tiered-training approach is the Explosive Ordnance Clearance Agent (EOCA) course. This program trains an engineer NCO in limited battlefield disposal of EH, and upon graduation, the soldier is awarded an additional skill identifier (ASI). There is an annual proficiency requirement to retain the identifier.

Other EOD/engineer integration efforts include the Explosive Hazards Coordination Detachment, which is responsible for analyzing EH incidents,

providing technical advice on EH, and creating and maintaining EH databases. The detachment includes the Explosive Hazards Coordination Cell (EHCC) and the Explosive Hazards Team (EHT). Each EHT is led by an EOD branch-certified captain and assisted by an EOD sergeant first class.

These are a few of the initiatives that CEHC and the Engineer School are engaged in to help our military defeat IEDs and EH while they fight the Global War on Terrorism. A common component of asymmetrical warfare is that the threat will continue to change and evolve as new TTP and devices to defeat US forces are explored. To predict and anticipate threat, our development of countermeasures must remain a constant evolution. Each of us can make a difference, and we must continue to evolve in order for our nation to remain a global leader of democracy. Change is an ongoing project that has no end: each battle fought relinquishes lessons learned and a better approach for the next battle.

Mr. Baker is the liaison officer for the Counter Explosive Hazards Center to the Joint Improvised Explosive Devices Defeat Task Force in Washington, DC. He served 21 years in the Army as a combat engineer. He holds a degree in human resource management from Park University.

Mr. D'Aria was the US Army Engineer School and Training and Doctrine Command senior engineer threat intelligence analyst from 1988 until his recent assignment as the technical director for the Counter Explosive Hazards Center. He served 10 years in the Army as a military police officer and Army aviator. His background is in combat developments, instruction, and training development.



Heavy Rescue Operations During Operation Iraqi Freedom

By Major Adam S. Roth

Bombing in Baghdad! You have probably heard that often in the past year or so and seen images of people digging through rubble with their bare hands to help those who are trapped in a building partially destroyed by a bomb. But after the bombing of the United Nations compound in the summer of 2003, we knew that something had to be done to protect the force during incidents such as this. We needed to be able to react appropriately in a chaotic situation and turn it into a managed process. The purpose of this article is to show how the 458th Engineer Battalion (Corps)(Wheeled) took a division-directed mission and turned it into a force multiplier for the 1st Cavalry Division.

Battalion Structure

The 458th, an Army Reserve unit from Johnstown, Pennsylvania, was alerted and mobilized in support of Operation Iraqi Freedom in November 2003. The battalion consists of a headquarters and headquarters company, three line companies—each with three line platoons of combat engineers transported by 5-ton dump trucks—and a support platoon with a complement of heavy construction equipment. The unit's wartime higher headquarters, the 1st Cavalry Division, directed heavy rescue training as a component of consequence management, resulting from

vehicle-borne improvised explosive devices (VBIEDs) or other catastrophic incidents in the division sector. The 458th is ideally suited to perform these functions due to the following organic assets:

- An ample supply of highly adaptable combat engineers
- Heavy equipment
- Experience in identifying and clearing unexploded ordnance (UXO) and improvised explosive devices (IEDs)
- Skills acquired from civilian experience

Mission

A team of battalion personnel who have civilian-acquired skills in heavy rescue, firefighting, emergency management, and US Army search and rescue performed a mission analysis. This team has experience at the 11 September 2001 Twin Towers and Pentagon attacks. The mission of the 458th—the Rescue One organization—is to conduct initial consequence management operations in response to civil disturbances, weapons of mass destruction (WMD), or VBIED mass-casualty incidents in the 1st Cavalry Division area of responsibility, providing heavy rescue and urban search-and-rescue assistance in a tactical environment to solve or mitigate the incident.

Vision

The training vision that emanated from this mission statement was a platoon for each of the three line companies capable of performing initial incident command and search-and-rescue assistance at a secure site. The core of Rescue One's leadership started to come to grips with a mission that has no formal US Army mission training plan. We relied on our collective experience and basic fundamentals from the Federal Emergency Management Agency (FEMA). We developed a four-phase training program with assistance from the Fort McCoy (Wisconsin) Fire Department while Rescue One was at the Fort McCoy Mobilization Station. The program included a selection process, classroom instruction, lane training, and confined-space training. The selection process included both technical skills and mental evaluation (for the stresses that the rescuer would experience). Classroom instruction focused on incident command, planning and organization, search-and-rescue techniques, basic rescue knots, shoring and cribbing, and patient packaging. Lanes training included surface search procedures for victims, confined-space rescue, and low-angle victim extraction using rope rescue techniques. The culminating event was a full-blown incident simulating a three-story building destroyed by a VBIED with full incident command and search for victims. Confined-space training focused on a low-light constricted environment with small search teams.

The Rescue One officers then developed follow-on training and sustainment training in theater that included mission readiness exercises, brigade-level rock drills, incident preplanning, and incident scenarios. Mission readiness

exercises focused on being able to move out with all equipment and personnel—implementing the lariat advance (alert advance call) used in Cold War Germany. The brigade-level rock drill rehearsed a major high-value target, including all subordinate staff down to the squad leader level. Incident preplanning of high-value targets included all required coordination between landowners, facility owners, staff, and emergency managers. Incident scenarios were coordinated with landowning brigade combat teams (BCTs).

Organization

The Rescue One organization is broken into three separate alarm responses: Alpha, Bravo, and Charlie.

Alpha Response

This is the initial response where all Rescue One officers respond to the incident scene, once dispatched by the 1st Cavalry Division. The primary purpose of the Alpha response unit is to size up the initial incident and determine additional resources. The incident commander makes two critical determinations upon arrival: expected duration of the incident (longer or shorter than 12 hours) and overall incident site security. The primary concern when operating in central Baghdad, instead of downtown New York City, is that security is crucial in all vehicular movements. Driving with lights and sirens is not possible.

Bravo Response

This is a single sapper platoon of search-and-rescue specialists, transported in organic vehicles. The Bravo

Photo by Major Adam S. Roth



Rescuers employ airbags to free a trapped victim.

response unit can perform search-and-rescue operations and shoring.

Charlie Response

The Charlie response unit—the remaining two platoons from each of the line companies—sustains operations for a longer duration. The unit brings life support items such as tentage and lighting for sustained operations in a secure location.

Incident Command

A secure scene is key to a successful deployment. There must be 360-degree security around the incident scene prior to employment of rescue personnel. This is normally provided by the landowning BCT. Once the site is secure, each element is assigned a sector by the incident commander and maintains radio communications with all employed search teams during the entire operation.

Accountability of personnel, tools, and equipment (controlled through regulated access to the site) and rescuer safety is critical for the incident commander. He must also manage many external assets contributed by US military, coalition, and host nation forces:

- Firefighting forces
- Police and security forces
- Hazardous material (HAZMAT) and nuclear, biological, and chemical (NBC) agents
- Public Affairs Office
- Host nation government
- Local utilities

Unity of command is imperative in this structure so all components are working toward the same goal. The use of interpreters is also critical when working through the myriad of issues that the host nation can assist with.

Actions on Scene

Once incident command is established, as with all military operations, a priority of work is established. The steps, generally followed in this order, are site survey, surface search, confined-space rescue, and high- and low-angle rescue.

- **Site Survey.** After arriving on scene, the officers of Rescue One quickly ascertain which portions of a structure, or structures, are accessible.
- **Surface Search.** The Halo search method (systematic calling and listening) is used.
- **Confined-Space Rescue.** Once it is determined that a victim is in a confined space, rescuers use a combination of mechanical tools, air-monitoring equipment, and hand tools to enter the confined space. With a combination of searching and shoring, the team enters the void and extracts the victims.

- **High- and Low-Angle Rescue.** Frequently, the effects of bomb blasts will either create a deep crater or take out normal means of egress (such as a stairwell).

Training

The battalion's heavy rescue unit has conducted numerous training events in conjunction with the supported BCTs. Training always began with an alert phase, followed by either a ground or an airmobile movement of the Alpha and portions of the Bravo response units to the incident location. Due to heightened security concerns post-blast, the unit often traveled via air since ground main supply routes and entry control points were frequently secured. The scenario included employment of the Charlie response unit's staging of equipment for later employment. Training scenarios also included integration of supporting firefighting organizations (fighting real fires developed for the scenario) and medical organizations (establish a casualty collection point, conduct triage, and transport casualties) under the incident command of Rescue One. Rescuers had the opportunity to perform technical rescue operations.

Employment

The battalion's heavy rescue unit met with many of the supported BCTs within the Task Force Baghdad area of responsibility very early in the deployment and conducted site assessments of major high-value targets. Critical structural, contact, and accountability information saves time in the event of an actual incident. Rescue One supported postblast consequence management at two vehicular bombings and assisted in numerous vehicular entrapments and mass-casualty events as a result of VBIEDs.

Summary

The 458th Engineer Battalion provides a substantial capability, tackling a nonstandard—but very critical—mission for forces entering a battlespace lacking the infrastructure (either coalition or host nation) to conduct rescue operations in the event of WMD or VBIED incidents. This enhances force protection for the entire force and is a force multiplier for all maneuver commanders in a postblast environment with multiple entrapped casualties. The framework of Rescue One provides a critical asset to the maneuver commander in an expeditionary theater and, given the current operating tempo and threat, should be considered as a primary mission in Future Force development and deployment decisions.



Major Roth is the executive officer of the 458th Engineer Battalion and the battalion chief of Rescue One. He is also a volunteer firefighter in Johnstown, Pennsylvania. He has commanded a combat heavy company and has served in numerous staff and leadership positions. He holds a master's in mechanical engineering from Boston University.



EOD AND ENGINEERS "CLOSE THE GAP"

By Lieutenant Colonel Craig Jolly

"The artificial separation between explosive ordnance disposal (EOD) personnel and combat engineers MUST end. . . combat engineers will deal with unexploded ordnance (UXO) whether we want them to or not. . . just a matter of inadequate EOD troops to the UXO task. This is a structural deficiency that it is imperative for us to fix."

*Brigade Commander
3d Infantry Division, Iraq*

Today's construct for operating in explosive hazards (EH)-contaminated theaters fails to provide maneuver commanders the freedom of action to accomplish missions effectively in the contemporary operating environment (COE). The problem has many aspects: an EOD construct based on Cold War doctrine, an enemy able to press home an asymmetric advantage through the gap caused by this doctrine, and a world increasingly filled with EH. Many would say that an easy fix is to transfer proponentcy for EOD to the Engineer Regiment. However, ownership does not correct the root causes of the problem, which are a lack of integrated EH planning and a graduated response to EH contamination. On 1 September 2004, the Commanding General of the US Army Training and Doctrine Command (TRADOC) approved a solution—hammered out over an 18-month period by the Ordnance and Engineer Branches—to bridge the EH capability gap. In order to understand the solution, we must first examine the problem and its causes. This will provide a framework to outline the approved course of action that will provide assured mobility to the force in an EH-contaminated environment.

Background

After the Vietnam War, the focus of the US Army was the conduct of operations on a linear battlefield, against a peer or near-peer adversary. The operational synergy developed between the Engineer and Ordnance Branches for the conduct of EOD operations during the Vietnam era eroded as the Engineer Regiment concentrated its attention on breaching linear obstacle belts.¹ This approach created a mobility support architecture that was effective during the Cold War but is dysfunctional in relation to the assured mobility concept developed for current operations. This gap is illustrated in Figures 1 and 2.

The US Army Legacy Force (now known as the Current Force) was developed to counter the Cold War threat. The Vietnam-era requirement to clear explosive ordnance (EO) for safety and immediate tactical movement is no longer trained due to the doctrinal approach of warfighting that was developed in the 1980s. The art of disrupting booby traps and UXO clearance has eroded to the point that no institutional knowledge exists in the Engineer Regiment. An example of the current asynchronous environment is the conduct of area clearance operations in Afghanistan, which have been slowed dramatically by the requirement for EOD technicians to deal with each item of UXO encountered.² Clearing mines and booby traps is the responsibility of engineers, providing they have been trained. However, engineer elements have not been trained to complete the entire task of UXO clearance.

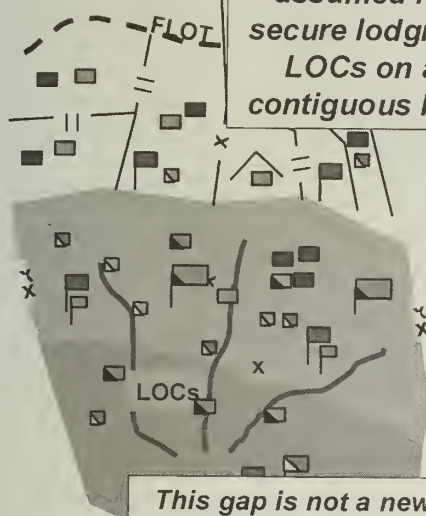
Currently, engineers can be called on to reduce or clear nonmine UXO hazards, on a limited basis, under the direct technical guidance of EOD forces.³ The current paradigm is that direct technical guidance requires the direct supervision of an EOD technician. However, sending a highly trained EOD technician forward to deal with a mortar round or simple blast mine is analogous to sending a brain surgeon to stitch a finger. It is clear that just as calling for indirect fires is a task shared by forward observers and infantry section commanders, certain aspects of EOD should be shared tasks on the battlefield. Since close combat in tunnel systems, booby trapped weapon caches, and military operations in urban terrain (MOUT) over a dirty battlefield are now the reality—and the doctrine exists to enable engineers to conduct limited UXO clearance—why is there a problem?

In the early stages of both Operations Enduring Freedom and Iraqi Freedom, the assets allocated to conduct mobility support tasks were not adequate in quantity or coordinated in time and space to adequately meet the maneuver requirements.⁴

*Are we fighting the last war,
today's war, or tomorrow's war?*

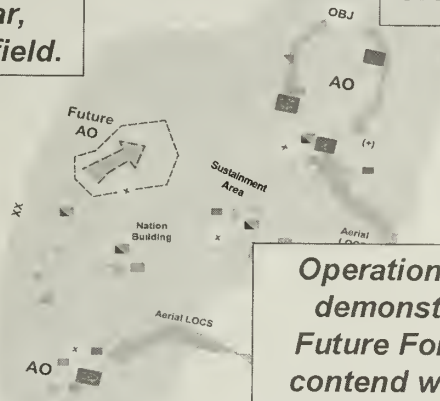
In the Past

*The Cold War doctrine
assumed relatively
secure lodgments and
LOCs on a linear,
contiguous battlefield.*



*This gap is not a new challenge; we saw it to
some degree in Operations Desert
Shield/Desert Storm, Somalia, Haiti, Bosnia,
Kosovo, and now Operation Iraqi Freedom.*

Today and Tomorrow



*Operation Iraqi Freedom
demonstrated that the
Future Force will have to
contend with threats on a
nonlinear, noncontiguous
battlefield with relatively
unsecure LOCs.*

Legend:

AO = area of operation
FLOT = forward line of own troops

LOCs = lines of communication
OBJ = objective

Figure 1. The Gap

Sappers
Breaching

UXO
Clearance Operations
Humanitarian Demining
Search Operations
(Booby Traps, IED, Explosive Hazards)
Mine/UXO Awareness Training
Sensitive Site Exploitation (SSE)
Command and Control / Synchronization /
Coordination
Captured Arms and Equipment (CAE)

EOD
RSP
CBRNE
IEDD

Legend:

CBRNE = chemical, biological, radiological, nuclear, and high-yield explosives

IEDD = IED defeat

RSP = Render-safe procedures

Figure 2. Interpretation of the Gap

As limited EOD assets were held at the highest levels, maneuver commanders were faced with the decision to either sacrifice tactical and operational momentum for safety or use their embedded assets to get on with the job. When these tasks were performed as part of an operation to maintain operational areas (for example, route or area clearance operations), clear coordination of the engineer and EOD effort was required. But without embedded EOD planning staffs, this did not occur. This can be directly attributed to EOD personnel not being integrated into the planning process, and it is considered to be the cause of the perceived lack of responsiveness of EOD personnel⁵ and the EOD-engineer tension in theater.⁶

The Solution

On 19 March 2004, the Chief of Staff of the Army (CSA) directed TRADOC to investigate the advisability of assigning proponentcy for EOD to the US Army Engineer School. The possibility of this had already been under consideration for more than 12 months by an EOD-engineer working group cochaired by the Ordnance and Engineer Schools. It was determined that a simple change of proponentcy did not address the root cause of the problem—a dysfunctional planning process combined with an EH reduction construct based on Cold War doctrine. The integration of EOD planning into the mobility/countermobility/survivability (M/CM/S) Battlefield Operating System (BOS)—combined with the development of a complementary set of EOD and combat engineer skills to deal with EO—had already been identified as the appropriate solution.

To counter the threat, EOD capabilities must be integrated among the various units participating in any operation.⁷ Doctrinally, it appears that this issue is clear-cut.^{8,9,10} Organizationally and operationally, this planning does not occur adequately and is based more on the personality of the EOD commander. The integration of this capability into the M/CM/S BOS is imperative; otherwise, command, control, coordination, and synchronization of capabilities cannot be achieved. The first step to bridging the gap is to synchronize EOD capabilities on the battlefield, ensuring uninhibited mobility in order to maximize combat power at the decisive time and place.¹¹ Organizationally, this is to be achieved by the establishment of EOD staff cells combined with the establishment of explosive hazards coordination cells (EHCCs)¹² and explosive hazards teams (EHTs)¹³ within the Engineer Regiment to apply the appropriate effects on the battlefield.

EOD could be synchronized through the M/CM/S BOS by—

- Developing a common operational picture (COP) through an understanding of EH and their effect on maneuver, combined with predictive analysis to identify probable contaminated areas.
- Selecting, establishing, and maintaining operating areas through avoiding or reducing EH.

- Attacking the enemy's ability to influence operating areas by synchronizing EO clearance capabilities on the battlefield to mitigate risk and reduce EH in areas we wish to operate.
- Maintaining mobility and momentum through the provision of the right level of EOD support for breaching and UXO clearance operations.

How these staff cells are to be integrated with the M/CM/S BOS is depicted graphically in Figures 3 and 4.

While it is clear that the M/CM/S planning capability must be rectified, training must also be conducted to tackle the functional gap between EOD and engineers. As the COE is not characterized by the United States having a peer adversary, enemy forces must use asymmetric approaches to negate US superiority. The second component of the solution is the establishment of an EH-reduction construct to provide a graduated response on the battlefield. A truly graduated response requires the force to deal with EH, within its limitations, at each level and is analogous to the soldier-combat medic-doctor-surgeon construct for the treatment of casualties. The current capability set is outlined below:

Warfighter. The warfighter must be able to identify and react to UXO and react to IEDs.

Explosive ordnance reconnaissance agent (EORA). An EORA can be trained by an EOD company, on request, and is responsible for "the investigation, detection, location, marking, initial identification, and reporting of suspected EO, in order to determine the need for further action."¹⁴ Although an EORA Course has been developed, there has been an extremely limited number of individuals trained. This capability is very similar to the Explosive Hazards Awareness Training (EHAT) conducted by the Counter Explosive Hazards Center at the Engineer School, which is given to deploying engineer units and other selected individuals as part of their predeployment training. This capability is considered to be the next level in the continuum.

EOD technician. An EOD technician is capable of "the detection, identification, field evaluation, rendering-safe, recovery, and final disposal of UXO. It may also include the rendering-safe and/or disposal of EO which has become hazardous by damage or deterioration, when the disposal of such EO requires techniques, procedures, or equipment which exceed the normal requirements for routine disposal."¹⁵

Bridge to the EH Capability Gap

It is the delta between the highly trained EOD technicians (who conduct both the rendering-safe and disposal of munitions), the EORA- or EHAT-trained soldiers (who conduct recon-naissance), and the Engineer Regiment's current capability that is the functional gap in the current EH construct. To fill this gap, a needed skill has been identified—an explosive ordnance clearance agent (EOCA)—and the new construct is depicted graphically in Figure 5, page 44. An EOCA is an

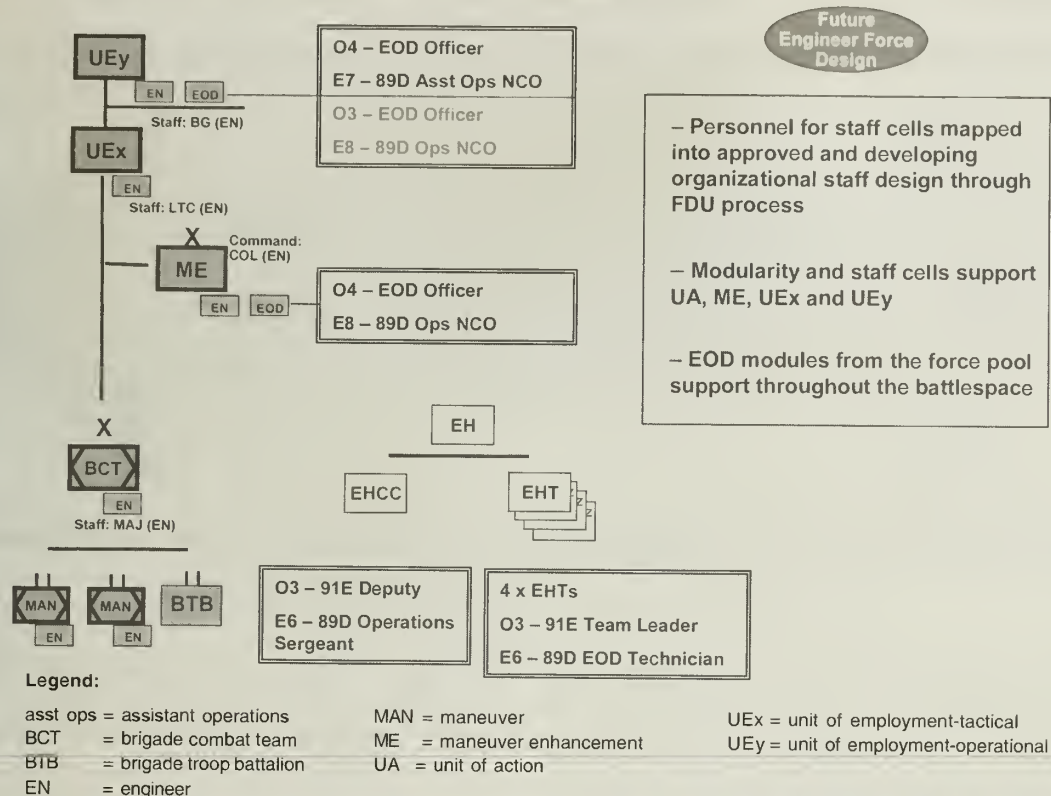


Figure 3. EOD Staff Integration

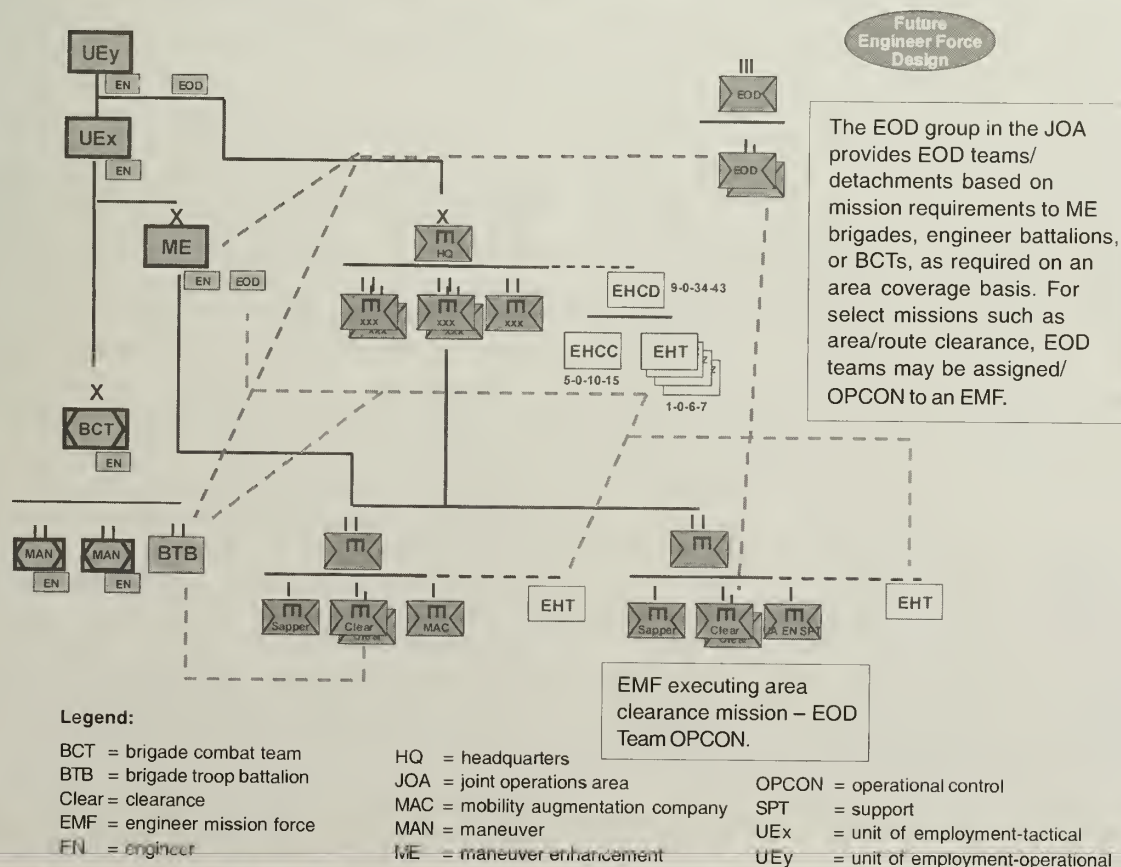


Figure 4. EOD Coverage in the JOA

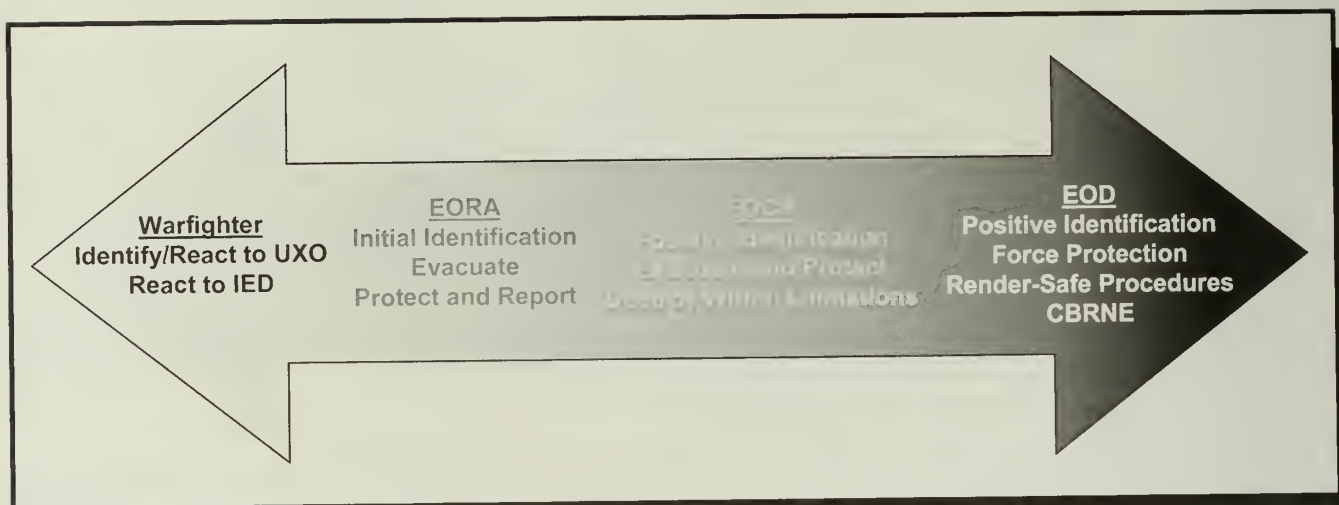


Figure 5. Approved Explosive Hazards Reduction Construct

engineer with an additional skill identifier (ASI), who is capable of investigating, detecting, locating, marking, reporting, and preparing protective works for UXO. EOCA skills also includes the disposal in place—when authorized by the EOD staff cell—of UXO identified in draft Technical Manual 093-89D-02, *Explosive Ordnance Clearance Manual*,¹⁶ and theater-specific UXO, after risk analysis and positive identification.¹⁷

Assured Mobility

So how does this tie to assured mobility? Assured mobility is the Engineer Regiment's cornerstone doctrine and outlines how the Regiment interacts with other BOSs and supports maneuver on the battlefield. The assured mobility concept requires engineers to be capable of integrating EOD capabilities into their operations to reduce EH in the battlespace in order to provide force protection and tactical mobility to the maneuver force. This is based on intelligence and integrated EOD planning and results in the right EH-reduction effect—coordinated in time and space—available to the maneuver commander for the conduct of operations. This facilitates tactical maneuver and immediately reduces the risk to the force from EO. When planned correctly, the maneuver commander is provided with an immediate measure of force protection and the capability of making an informed decision to either—

- *Ignore the threat* and continue the operation, accepting the potential consequences.
- *Avoid the threat* by diverting the operation and accepting the disruption to the plan.
- *Destroy the EO in place*, using his embedded engineer asset or allocated EOD element, which may impose a temporary halt to operations but decrease the risk to the force.
- *Remove the EO*, on advice from an EOCA or EOD personnel, if it is safe to do so.

- *Render-safe the EO*, if it poses a significant risk to the force, then remove for safe disposal. This option will impose the greatest time delay and will require the deployment of specialized EOD resources.

This approach has been accepted and approved by the Commanding General of TRADOC. A pilot Explosive Ordnance Clearance Course was conducted in Afghanistan in early 2005, and the first course at Redstone Arsenal, Alabama, began 1 March 2005. EOD planning cells are established in theater and will be expanded in concert with the developing EO clearance capability.

Conclusion

Engineers are on the battlefield now, destroying mines and UXO to meet operational requirements. They are meeting this operational necessity with minimal training in mine warfare and none in UXO clearance. Operations Enduring Freedom and Iraqi Freedom provide clear indications as to the types of environment in which US forces are likely to conduct operations in the future and signify the detrimental effect on the mobility and tempo caused by a lack of integrated EOD planning.

Given the amount of high-tech ammunition used by coalition forces, EO clearance is a priority force protection issue now. The conduct of EO reconnaissance and in situ disposal of UXO is essential to protect the force and provide freedom of maneuver to the commanders on the ground. To meet this challenge, the force requires a multitasked soldier who is capable of facilitating mobility and providing immediate force protection and EH reduction advice. This must be combined with the development of habitually associated EOD planning cells to synchronize the EOD effect at all levels. This serves to coordinate EOD effects on the battlefield, fully enable the EOD component of the force, and focus the efforts of the

EOD technicians to where they are most required—dealing with complex weapons that pose a high threat. EOD personnel and engineers must maintain a set of different, but complementary, skills to assure the mobility and protection of the force. Today's construct for operating in EH-contaminated theaters fails to provide maneuver commanders the freedom of action to accomplish missions effectively in the COE. However, tomorrow's construct will not only "close the gap" between EOD and engineers, it will close the gap that our enemies have been exploiting and save the lives of soldiers.



Lieutenant Colonel Jolly is an infrastructure project manager with the Australian Defence Organisation (ADO). He was previously the chief of the Engineer Command and Staff Course Division at the US Army Engineer School, Fort Leonard Wood, Missouri. He has served in a wide variety of engineer command and training assignments within the Australian Army. Command appointments include both the 35th Field Squadron and 23d Support Squadron, and his instructional appointments include a posting to the School of Military Engineering, where he served as the course manager for both the Regimental Officer Basic and Advanced Courses. He is a graduate of the Royal Military College-Duntroon and the Australian Command and Staff College. He holds a master's in management and defence studies from the University of Canberra.

Endnotes

¹ Major Craig Jolly RAE, US Army Engineer School "Closing the Gap" White Paper, March 2003.

² Interviews with Major Mark Griffin RE and WO2 Tony Quirk RAE from the Countermine/Counter Booby Trap Center (now the Counter Explosive Hazards Center), US Army Engineer School, Fort Leonard Wood, Missouri.

³ Field Manual (FM) 3-100.38, *UXO Multiservice Procedures for Unexploded Ordnance Operations*, 23 August 2001, Chapter III, p. 2.

⁴ Every commander commented on the requirement for a greater synchronization of EOD/engineer activities to provide assured mobility and force protection during the Operation Iraqi Freedom Engineer After-Action Review conducted in Baghdad, May 2003. Source after-action review video viewed by the author 12 May 2003.

⁵ On many occasions, EOD personnel were conducting higher-priority tasks. However, this was not evident to lower echelons of command because there was no command and control or communication established to facilitate this flow of information.

⁶ Engineer/EOD conference "Closing the Gap," Redstone Arsenal, Alabama, 9-11 December 2003.

⁷ FM 9-15, *Explosive Ordnance Disposal Service and Unit Operations*, 8 May 1996, pp. 1-2.

⁸ FM 7-15, *The Army Universal Task List*, 31 August 2003. Chapter 5 – The Mobility/Counter mobility/Survivability Battlefield Operating System, outlines the following: ART 5.3 Conduct Survivability Operations – ART 5.3.4 Provide Explosive Ordnance Disposal Support. 5-49. Neutralize domestic or foreign conventional, nuclear, chemical, and biological munitions and improvised devices that present a threat to military operations and military civilian facilities, materiel, and personnel, regardless of location.

⁹ CJCSM 3500.043, *The Universal Joint Task List*, 1 July 2002, does not mention EOD tasks except under SN 1.1.4 Provide for En Route Support and Clearances – Determine the need for EOD support.

¹⁰ FM 9-15, pp. 1-2.

¹¹ Ibid.

¹² The EHCC has a similar role as the Mine and Explosive Ordnance Information Coordination Center (MEOICC), which is currently deployed on Operation Iraqi Freedom and has integrated EOD planners.

¹³ An EHT is deployed with clearance modules and provides technical advice and assists in planning clearance operations. In peacetime, this organization is also responsible for training, sustaining, and certifying EOAs.

¹⁴ Army Regulation 75-14, *Interservice Responsibilities for Explosive Ordnance Disposal*, 14 February 1992, p. 1.

¹⁵ Ibid.

¹⁶ This manual is being developed by the Ordnance School, based on generic munitions, and will be supplemented by theater-specific addendums as authorized by the theater EOD staff cell.

¹⁷ This definition is to be articulated in all EOD-related doctrine.





CTC Notes



National Training Center

IED Defeat Training

By Captain Andrew Liffing, Captain Jason Railsback, and Captain Matthew Louvet

How is the National Training Center (NTC) adapting to the threats encountered by coalition forces in the Global War on Terrorism? The training center is continuously changing to meet current threats. In the past few years, NTC has evolved and now offers urban and subterranean training areas and a civilian populace on a noncontiguous battlefield with no suspension of battlefield effects.

NTC spirals in lessons learned from theater, feedback from combatant commanders, and observations from the Improvised Explosive Device (IED) Task Force—to name just a few—to develop relevant, threaded rotational scenarios and events. Each rotation is 14 days of continuous operations against a free-thinking and adaptive enemy. This enemy employs current enemy tactics, techniques, and procedures (TTP), and each rotation is given a role in which it acts and responds accordingly.

One of the most prevalent and deadly threats on today's battlefield is IEDs. They are replicated at NTC by a variety of means, and NTC provides great opportunities for full-spectrum, multiechelon training to defeat them. From the sensor in the observation post and squad on the ground, to the battalion and brigade battle staffs and their commanders, defeating IEDs requires an integrated approach across the breadth of the organization.

The following paragraphs briefly highlight some of the many initiatives and training opportunities that NTC offers rotational units to assist and train them in IED defeat at NTC.

IED Training Aids

The Opposing Force (OPFOR) at NTC attempts to replicate current enemy TTP in the manufacture and emplacement of IEDs. The OPFOR has the capability to initiate IEDs by either hardwire or by remote control. IEDs are divided into two main subcategories—detonating and nondetonating.

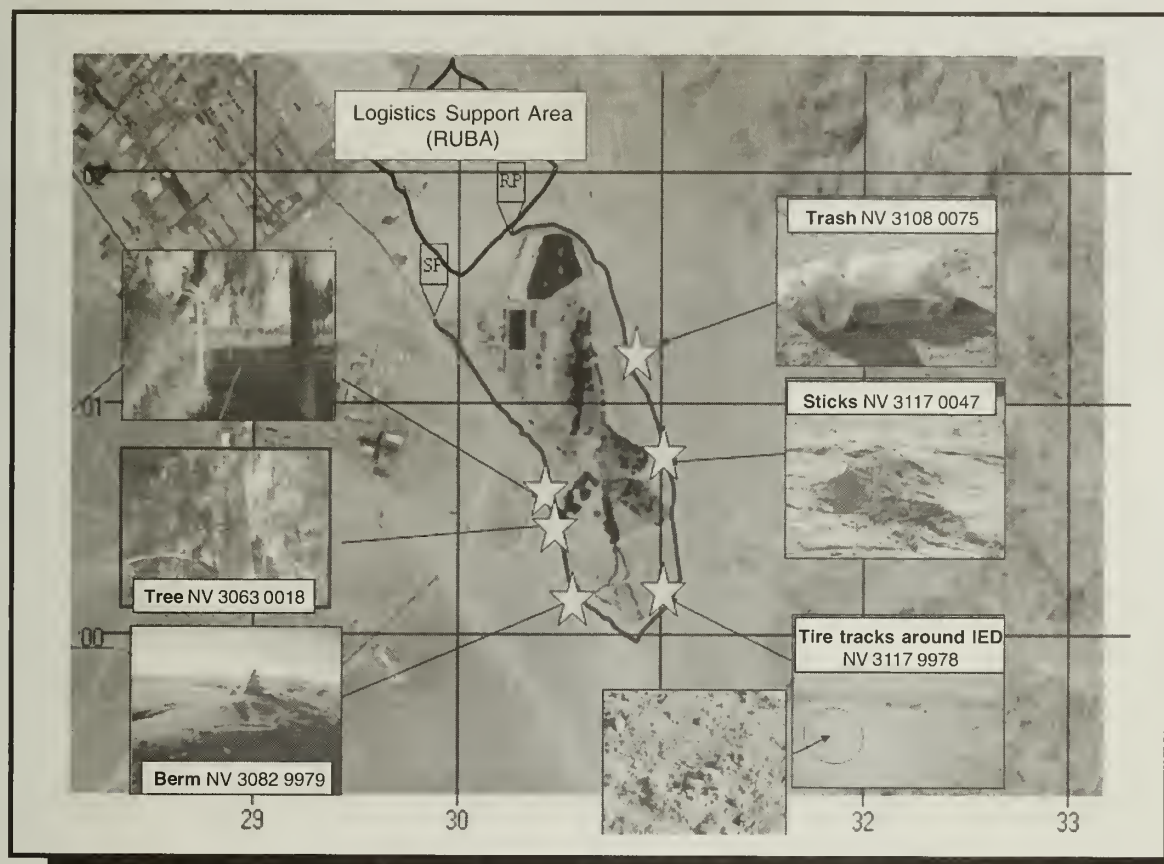
- *Detonating IEDs* are simply constructed and designed to test the unit's battle drills, reporting procedures, and casualty evacuation and vehicle recovery operations.
- *Nondetonating IEDs* are more complex and have all the components of an actual IED. They are designed to provide a more realistic and sophisticated device to train render-safe procedures to EOD technicians, and to better replicate visually what is found in theater. During each rotation, EOD personnel have the opportunity to use all their tools, including live demolitions, to neutralize explosive hazards.

Vehicle-borne improvised explosive devices (VBIEDs) are also replicated on the NTC battlefield. They consist of a vehicle, a smoke signature (such as a smoke generator or smoke pots), and an artillery simulator. Units have the opportunity to interdict, destroy, or react to the blast. Once a VBIED is detonated, postblast analysis or evidence collection may be conducted to determine the components and other characteristics that may be tied to an intelligence thread.

IED Indicators Lane

NTC offers an IED indicators lane that a unit is able to negotiate beginning on reception, staging, onward movement, and integration (RSOI) Day 1. This lane is set up by observer-controllers using indicators seen in theater. The lane is approximately 3 miles long and contains five to eight IEDs. It is designed to show participants signs that might indicate an IED along the route.

The brigade is issued a sample order and an answer key that shows the indicator and location of each IED along the route. The unit executes the lane at its discretion. The lessons learned from this lane are taken and used throughout the rotation. Units that take advantage of this opportunity show a greater likelihood of detecting IEDs and taking appropriate action before they detonate.



IED Indicators Lane at NTC

Route Reconnaissance/Combat Patrol Force-on-Force and Live-Fire Lanes

There are two specific training events in which rotational units are guaranteed an opportunity to react to an IED: the combat patrol force-on-force lane and the combat patrol live-fire lane. During each of these lanes, the combat patrol encounters a myriad of events requiring actions and decisions, including enemy contact and react to an IED. The element can put to use its IED detection skills from the indicators lane, as well as exercise its IED battle drills, casualty evacuation, and reporting procedures.

During the live-fire lane, units conduct similar tasks, but do so using live rounds. This trains and stresses to the unit the importance of, among other things, direct-fire planning, fire control and distribution, muzzle awareness, and risk management.

For engineers, these lanes are an opportunity to conduct IED-focused route reconnaissance. They are able to hone their unique skills and tools because the lanes are specifically designed to increase repetitions and provide a higher density of IEDs for the engineer element to encounter.

Free Play/Mission Rehearsal Exercise

During each rotation, the unit's tactical operations center (TOC) is provided with detailed intelligence and data of past

enemy activity to allow them to develop patterns to predict future enemy activity. Before a unit's 14-day training rotation, the staff is given information on enemy activity with respect to—among other things—IEDs. As the rotation plays out, units will further develop enemy patterns, allowing the unit to predict future OPFOR IED placement methods and locations and prevent these placements by either interdicting the construction, setup, or initiation of the IED.

New Equipment

Recently, NTC acquired the MATILDA I robot that units can draw and employ during their rotation. They can request to have classes taught during RSOI on its operation, capabilities, and limitations. This device will then be available for issue to rotational units.

The MATILDA's primary use is for reconnaissance, and it can be employed in urban environments or on route reconnaissance when identifying possible IEDs. The color and black-and-white cameras allow for remote-control use, increasing standoff and allowing for quick identification of objects. The manipulator arm allows the operator to move objects, and the attached zoom camera allows for even more standoff when identifying suspected explosive devices.

NTC also offers rotational units the opportunity to improve force protection and project planning using HESCO® bastions,

New Jersey barriers, Class IV supplies, and other materials that are available to units in theater.

EOD Integration

Typically, the rotational brigade is augmented by one explosive ordnance disposal (EOD) company. This usually translates to a headquarters/operations section and one to two EOD teams, each consisting of two to three EOD technicians. While the EOD team is given an opportunity to train its military occupational specialty (MOS)-specific skills with respect to IEDs on the battlefield, the brigade hones its ability to integrate this critical combat multiplier into its formation. Since this may be the first time the brigade has worked with EOD personnel, perhaps one of the most difficult lessons learned is the need to provide dedicated security for the EOD team(s). NTC attempts to show cause and effect so the hard lessons are learned before arriving in theater.

Another unique opportunity at NTC is live demolitions for all EOD operations. While EOD renders safe or neutralizes explosive hazards throughout the brigade's area of operation, the brigade is trained on all the coordination, management, and procedures required to perform live demolitions in its maneuver space.

IED Defeat Seminar

NTC—along with the Army Engineer Association—will host an IED Defeat Seminar at Fort Irwin from 13 to 17 June 2005. There will be briefings, guest speakers, vendors, live demonstrations, and breakout sessions—all focused on defeating IEDs. NTC will showcase some of the tools and training that rotational units receive when deployed to the training center. The POC for this event is Captain Railsback at <sw12@irwin.army.mil>.

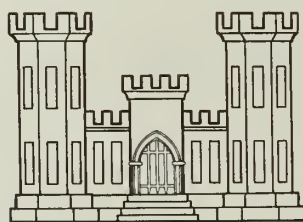


Captains Liffing, Railsback, and Louvet are currently serving as engineer company trainers at the National Training Center. All three are former engineer company commanders, are advanced course graduates, and have led combat engineer units during deployments for Operation Iraqi Freedom. For further information, contact them via email at—

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(*"Topographic Engineering," continued from page 13*)

for use in ABCS and FBCB2 on vehicles. The CTSF does this on an ongoing basis, and technical support teams in the field provide the same functionality.

Unit basic geospatial loads of digital maps, imagery, elevation data, feature data, and special terrain products are stored on the Army Map Server in each DTSS-Light. These map servers provide digital terrain products from NGA, commercial sources, DTSS, Army theater-level topographic engineering assets, and TEC. Products from the map server can be exported to ABCS via the tactical operations center (TOC) local area network (LAN). This data should not be pulled from one TOC to another over tactical communications links because of bandwidth limitations. The Army Map Server allows for storage of more than a terabyte of high-resolution data to be used as needed by battle staffs. It also enables terrain analysts to be geospatial managers on the battlefield and to ensure that all systems have access to the most current geospatial data and products. The Army Map Server is accessed via the Web interface in the TOC LAN, and system operators can graphically select or use geolocations to download terrain data and products into their system.

Summary

At the Engineer School, students are provided an excellent overview of topographic engineering, as well as top-level integrating skills they will need to bring it all together in the field. Some students will be assigned to units that will expose them to the "big picture" early on. They will benefit from this experience and will develop innovative ways to integrate engineer solutions for their customers. Others may not see how all of the pieces fit together, depending on their initial assignments, so it is important that they acquire an understanding of C2 integration concepts in career-level training classes. They should know which products from DTSS are used for different tactical situations and missions (TC 5-230), how to employ and lead terrain teams, what the different C2 tools are used for, and how to bring the right tools and skills to the situation at hand. Armed with this basic knowledge, students will more rapidly acquire additional digital topographic C2 skills and tools as they are deployed to different assignments throughout the Army. These skills and tools are key enablers for engineers as the masters of terrain to achieve assured mobility.



Mr. Bergman, a member of TEC, is assigned to Fort Leonard Wood, Missouri, where he supports the TRADOC Program Integration Office for Terrain Data. A Naval Academy graduate, he has a master's in systems engineering from George Mason University and is a former Marine.

Note: The author wishes to thank members of the Project Director, Combat Terrain Information Systems Office, and TEC, who provided significant input for this article.

ANTIPERSONNEL OBSTACLE BREACHING SYSTEM

By Mr. Bobby Skinner

The Antipersonnel Obstacle Breaching System (APOBS) will soon be available for light engineer unit training. The training strategy can be found in Department of the Army Pamphlet 350-38, *Standards in Weapons Training*. The strategy is designed for all 21B combat engineers in light engineer platoons to fire one live APOBS annually. Other light units (11B infantryman, 19D cavalry scout, and 18C special forces weapons sergeant) will fire a live APOBS while training at the National Training Center or Joint Readiness Training Center.

The APOBS is a two-soldier, portable, linear demolition charge that is used against antipersonnel mines and wire obstacles. It consists of five major components: a rocket motor, a fuse, a 25-meter line charge consisting of 60 grenades and detonating cord, a

20-meter line charge consisting of 48 grenades and detonating cord, and a container for shipping or storage. The APOBS has two molded plastic prepackaged backpacks to hold the line charges. The 65-pound backpack contains the front 25-meter line charge and the line-charge connector and has a provision to hold the rocket launch rod. The 55-pound backpack contains the rear 20-meter line charge. The two users open the backpacks, connect the two line charges, emplace the rocket on the launch rod, aim, and ignite the rocket motor, which launches and carries the two connected line charges across the obstacle to be breached. A drogue parachute, attached to the end of the 20-meter line charge, provides stability during flight. When the 45-meter line charge is directly over the obstacle, the fuse ignites the detonating cord, which

activates the grenades. The APOBS can be fired in either command mode or delay mode. The system includes a tool kit with spare parts, a screwdriver, ear plugs, and a field card that provides technical data.

The US Army Engineer School Standards in Training Commission Manager can be contacted at 573-596-0131, ext 36243 or DSN 676-6243.



Mr. Skinner is the US Army Engineer School Standards in Training Commission Manager. He served in the US Army for 26 years, with 23 years as a 12B combat engineer. He has had various assignments, including Leadership Task Force for the Chief of Staff of the Army, and Assistant Commandant of the Libby Noncommissioned Officer Academy.



APOBS



EQUIPPING THE FUTURE FORCE SAPPER

By Captain Michael P. Frank

What makes the Future Force sapper a unique soldier on the battlefield? What capabilities will he bring to the warfight? This article highlights some of the capabilities and systems that will make sappers indispensable and relevant to Future Force operations.

Assured Mobility

Key to the success of the Future Force will be its ability to maintain an unprecedented level of freedom of maneuver. This will be accomplished by using emerging technologies, some on maneuver platforms and some manned by sappers. To provide assured mobility, we must see first, understand first, act first, and finish decisively. The Future Engineer Force (FEF) will add increased mobility and enhance the combined arms force to move across the battlefield with increased survivability. The FEF will be able to quickly locate and neutralize all antitank and antipersonnel mines and other explosive hazards (EH) to enhance mobility and force protection.

Counter Explosive Hazards Capabilities

The FEF will see significant increases in counter EH capabilities through significant technological advances and changes in organizational design. Technological advances include predictive tools, standoff detection, command and control, increased situational awareness, robotics, and enhanced force protection. Organizational design changes are focused to support modularity, and they significantly differ

from any changes throughout our Regimental history. These changes will enable maneuver, maneuver support, or maneuver sustainment operations by allowing our forces freedom to maneuver when and where they want by denying an opponent's ability to use EH against them.

The Future Force brigade combat teams (BCT), equipped with the Future Combat System, will use its embedded technologies to provide assured mobility in support of maneuver. The BCTs are also a significant organizational change as sappers are replaced by embedded capabilities provided by technology. The embedded technologies of the BCT are enhanced situational awareness and prediction tools linked to standoff detection and neutralization capabilities, enabled through robotics. The more effective prediction capabilities will allow the FEF to focus the employment of detection technologies on the high-risk and high-payoff areas of interest required to support maneuver. Enhanced command and control capabilities and real-time situational awareness will enable commanders to make informed decisions on bypass or precision maneuver. Robotics will be used to reduce the workload and to perform dangerous and hazardous tasks.

Technological advances and organizational design changes will also enable sappers to provide assured mobility for maneuver support and maneuver sustainment operations. The fielding of our objective capabilities changes detection and standoff neutralization, and enhanced individual and platform protection will significantly improve our route and area clearing capabilities. Until these technologies mature and are fielded

across the force, we will provide the initial capability through commercial off-the-shelf systems and the creation of the engineer clearance company. The future engineer clearance company will consist of a headquarters section, three route clearing platoons, and an area clearing platoon. The route clearing platoon will be equipped with a vehicle-mounted mine detector, a mine-protected interrogation vehicle, and a medium mine-protected vehicle.



RG-31 Medium Mine-Protected Vehicle

Similarly, the future area clearing objective capability is an autonomous or semiautonomous robotic day and night area clearance capability. Until the required technology matures, we will equip the area clearance platoons with medium and mini-mechanical flails, mechanical proofing, enhanced neutralization capability, and mine-protected command and control platforms similar to those in use by sappers supporting current combat operations. Mine detection dog teams will provide additional proofing capability. (See *Engineer*, July-September 2004, page 18.)



MV-4 Medium Mine Flail

This combination of new technologies and future organizational changes will assist in denying an opponent the ability to use EH as antiaccess or area denial capabilities. However, sappers will always be required to counter existing and future EH threats to meet the commander's intent. The FEF will be equipped and organized to provide these critical capabilities.

The FEF has a new piece of robotic countermining equipment, the Mechanical Antipersonnel Mine Clearing System (MAPMCS), which is used in current combat operations. The working principle is based on simultaneous use of two tools, the flail and roller, providing highly reliable mine clearance. The flail rotor has a number of chained hammers to conduct mine clearing. The flail hammers are made of high-quality material that is heat-treated and wear-resistant. The chained hammers and high rotational speed of the flail enables the machine to dig and powder antipersonnel mines until detonated or shattered. The machine is remotely controlled from a safe distance or an armored vehicle. The system is employed remotely to antipersonnel minefields and activates trip wires.

The MATILDA, a small, man-portable robot that includes a manipulator arm, a fiber-optic control kit, and extended-run batteries, is also in the FEF tool bag. The robot is used for military operations in urban terrain (MOUT) and tunnel and cave missions. The MATILDA provides standoff capabilities that keep soldiers out of danger areas for long periods of time while performing hazardous missions.



MATILDA Robot

Demolitions Capabilities

Demolitions, another area where sappers bring a critical capability to the warfight, will be used in a variety of roles, from assuring mobility in MOUT, to destroying improvised explosive devices (IEDs). An assessment of demolitions capabilities for sappers determined that current capabilities are spread across many different systems and require improved handling characteristics like portability, rapid emplacement and

execution times, ease of operation, and reduced minimum safe distances (MSD). The Tactical Explosives System (TES), a "system of systems," is the future of Army explosives. The TES consists of two primary subsystems, a family of initiators, and a modular charge capability. The initiators will be controlled via a man-in-the-loop, the Tactical Internet using battle command capabilities, or programmed smart algorithms. The TES will follow a spiral development approach to maximize the availability of current and future technologies while providing incremental but satisfactory capabilities that support the sapper.

The FEF requires a remote command-initiation capability for demolition missions. The TES uses the Remote Activation Munitions System (RAMS) as a springboard to develop the TES remote initiation capabilities for the family of initiators. RAMS provides the sapper the capability to remotely initiate munitions and propagate an untethered line-of-sight (LOS) and non-line-of-sight (NLOS) signal to deliver the desired effect through an asymmetric battlespace. Through technology improvements, RAMS integrates several technologies to provide an untethered remote LOS and NLOS initiation capability. RAMS uses one modular system for demolition initiation tasks, which improves portability and decreases the soldier's vulnerability to threat fires by lessening exposure time. Furthermore, RAMS significantly lightens the load the soldier has to carry to employ demolitions and reduces breaching times during urban operations. This retains the element of surprise from the forced-entry technique and allows the soldier to engage hostile targets with a greater tactical advantage. RAMS can be emplaced by hand and by unmanned ground vehicles (UGVs) and unmanned aerial vehicles (UAVs).

The TES incorporates the capabilities of a special operations forces demolition kit (SDK) and an urban operations set (UOS) as the first modular charge capability. The SDK-UOS provides the capability to tailor charges to the target and eliminates the various ad hoc charges currently being constructed for various missions. The SDK-UOS allows the sapper to construct the smallest, lightest charge feasible that allows tailored standoff distances suitable for specific missions and maximum precision for numerous types of targets and mission scenarios. Additionally, the SDK-UOS provides state-of-the-art methods to attach charges to targets. The SDK-UOS modular charges can be emplaced by hand and by UGV and UAV, providing the sapper the first capability to neutralize targets from a standoff.

The SDK-UOS also provides stand-alone capabilities to the sapper that will ultimately reduce MSDs in Army doctrine to safely perform breaching operations through hearing, blast, and fragmentation protection devices. Furthermore, the SDK-UOS provides a capability to nonexplosively cut through material when explosive breaching is not permitted.

Finally, the rapid wall breaching kit (RWBK) is a man-portable, rapidly deployable system that provides an organic capability to gain forced entry into buildings to maintain freedom of maneuver and to shape the battlespace for friendly forces in an asymmetric battlespace. The RWBK provides a

capability that is preformed, prepackaged, easily and rapidly employed, lightweight, and safe.



Rapid Wall Breaching Kit

Conclusion

This combination of new technologies and future organizational changes will assist in denying an opponent the ability to use EH as antiaccess or area denial capabilities. The technologies provide an increased level of safety by using unmanned vehicles (robots), giving Future Force sappers a standoff capability, enhancing their ability to breach obstacles, and continuing to provide assured mobility for maneuver. The FEF will be equipped and organized to provide these critical capabilities.

These are just a few of the capabilities and systems sappers will bring to the future battlefield. These capabilities are not generally transferable to a maneuver platform, and even if they were, infantry and armor soldiers will not have the time to train to proficiency on executing these missions and operating these systems to achieve the desired effect. So it is safe to say that the Future Force sapper will be a critical enabler of assured mobility and mission success in Future Force operations.

Captain Frank is a field artillery officer working in the Acquisition Corps, Program Management Functional Area, as a team chief for Mine/Countermine, Robotics, and Demolitions in the US Army Engineer School, Directorate of Combat Developments, Fort Leonard Wood, Missouri.



Combat Service Support to the Future Engineer Force: A Modular Approach

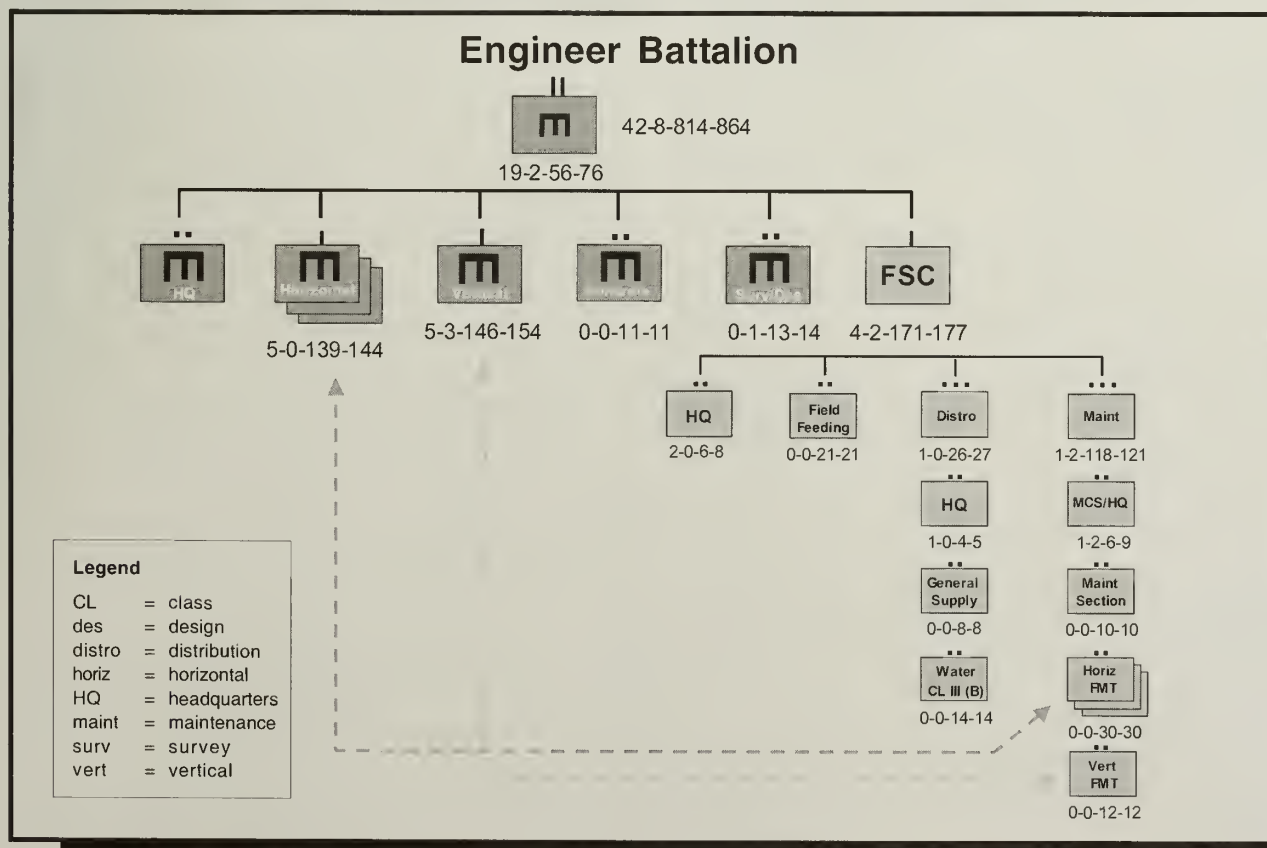
By Major Brian D. Slack

By now, almost everyone in the Army has heard of the terms *modularity* and *expeditionary*. Most of the uncommitted Army (not currently deployed or preparing to deploy in support of the Global War on Terrorism) is consumed with transforming its Cold War formations into brigade combat teams (BCTs), units of employment (UEs), and support brigades. As the Army moves along its transformation path, a fundamental change in how these new organizations are supported will be required if they are to be truly modular and expeditionary. The concept of modularity is predicated on units that are flexible and agile: scalable formations that can be mission-tailored for specific operations. For these

units to be sustainable, a new modular approach to combat service support (CSS) is needed. In conjunction with the US Army Engineer School, the Combined Arms Support Command has developed a modular support organization for the Future Engineer Force (FEF) that is modeled after the CSS being provided inside the new BCTs. The forward support company (FSC) is the cornerstone of sustainment for the FEF (today's corps- and theater-level engineer battalions). The figure below shows an example of an engineer battalion with its FSC and forward maintenance teams (FMTs).

The concept of maintenance support for the FEF starts with uniquely designed FMTs that are organic to each engineer company. These FMTs perform field-level

maintenance (previously referred to as organizational- and direct-support maintenance) under a two-level maintenance concept. In the two-level concept, the FMT is manned and equipped to perform both organizational- and direct-support maintenance. In garrison, FMTs plug into the maintenance platoon of an FSC that is organic to each engineer battalion. If an engineer company gets task-organized with a different deploying engineer battalion, the engineer company's FMT also gets task-organized under the gaining engineer battalion's FSC maintenance platoon. Each FMT—equipped with its own Unit-Level Logistics System-Ground (ULLS-G) and prescribed load list (PLL)—performs all repairs, parts requisitioning, dispatching,



and services for its engineer company. This plug-and-play concept of maintenance support truly enables sustainment of any combination of forces tailored into an engineer mission force (EMF). The base maintenance section of the FSC is designed to provide maintenance support for the engineer battalion headquarters and any specialty platoons/sections, as well as the FSC. In the maintenance control section (MCS) of the maintenance platoon, a maintenance control officer and two warrant officers (senior automobile maintenance officer and engineer equipment repair technician) provide maintenance management of the engineer battalion's equipment.

Concerning the remaining areas of CSS, the FSC is designed to provide a 90 percent solution for the sustainment of an engineer battalion composed of five to seven engineer companies combined into an EMF. The field-feeding section is equipped to provide mess

support for five to seven engineer companies. The distribution platoon orders and distributes all classes of supply within the battalion or EMF. It carries the sustainment stocks that exceed the organic carrying capability of the engineer battalion for three days of high-intensity conflict or seven days of low-intensity conflict. Medical support is provided by organic medical assets in each engineer company headquarters and a medical treatment section in the engineer battalion headquarters. Combat engineer companies are supported by a senior medic and one trauma specialist per line platoon. Construction engineer companies are supported by one trauma specialist. The engineer battalion medical-treatment section is composed of a physician's assistant, a trauma sergeant, two trauma specialists, and a four-litter ambulance.

Based on a still-developing concept, future engineer brigades will receive CSS on an area support basis from a combat

service support battalion (CSSB). The CSSB will provide the link between the FSCs that support each battalion-sized EMF and higher-level sustainment forces in the theater support command. As required, the CSSB will augment FSCs with maintenance, transportation, and other logistical support. The combination of FSCs and CSSBs will provide sustainment across the full spectrum of operations for the FEF and would be in concert with the Army's construct for support of the Total Army Force. 

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Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since the last issue of *Engineer*. We dedicate this issue to them.

Second Lieutenant Christopher W. Barnett	1st Battalion, 156th Armored Regiment	Shreveport, Louisiana
Specialist Justin B. Carter	1st Battalion, 15th Infantry Regiment	Fort Benning, Georgia
Staff Sergeant Joseph E. Rodriguez	8th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Sergeant Andrew L. Bossert	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Private First Class Michael W. Franklin	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Specialist Bennie J. Washington	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Specialist Matthew A. Koch	70th Engineer Battalion, 3d Infantry Division	Fort Riley, Kansas
Specialist Johnathan Castro	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Private First Class Lionel Ayro	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Sergeant Lynn R. Poulin	133d Engineer Battalion	Belfast, Maine
Specialist Thomas J. Dostie	133d Engineer Battalion	Portland, Maine
Sergeant First Class Sean M. Cooley	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Specialist Robert A. McNail	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Specialist Seth K. Garceau	224th Engineer Battalion	Burlington, Iowa
Second Lieutenant Richard B. Gienau	224th Engineer Battalion	Burlington, Iowa
Specialist Lyle Rymer	239th Engineer Battalion	Fort Chaffee, Arkansas
Specialist Nicholas C. Mason	276th Engineer Battalion	West Point, Virginia
Specialist David A. Ruhren	276th Engineer Battalion	West Point, Virginia
Staff Sergeant Johnathan R. Reed	1088th Engineer Battalion	New Roads, Louisiana
Specialist Michael S. Evans II	1088th Engineer Battalion	New Roads, Louisiana
Specialist Christopher J. Ramsey	1088th Engineer Battalion	New Roads, Louisiana

THEATER ENGINEER TRANSFORMATION

By Colonel Gerald Lago



Photo courtesy of US Army

The Future Force is quickly transforming into the Current Force. Throughout this transformation, engineer support has not been a primary consideration for Army modularity. Over the past year, new Army concepts and organizations have regarded engineer requirements as little more than an afterthought. From the brigade combat teams through the unit of employment-operational (UEy), the Army has been left with stripped-down organic engineer units and minimal engineer staffing. Fortunately, the Engineer Regiment has been successful in complementing the Army modularity efforts with its own modular-designed engineer units and command and control (C2) structure (also known as the Future Engineer Force) and addressing these underresourced requirements in support of the warfight. The Engineer Regiment has successfully integrated the vast array of engineer disciplines throughout the battlespace, except in one key area—the theater.

There are still wide engineer staff, C2, and technical gaps at the UEy and the Regional Combatant Command (RCC) that need to be satisfied. The US Army Corps of Engineers® (USACE) and the existing Engineer Commands (ENCOMs) can possibly fill these gaps. However, they need to be organized in such a way that they are not only responsive to the commander's changing needs, but also so they can add value

effectively and efficiently. This author proposes that a new organization be designed to leverage the existing capabilities and provide the much-needed synergy to the theater-level engineer support effort.

Future Force Environment

Based on the concepts under development, the UEy has an assigned sustainment, network, intelligence, and civil affairs headquarters. But that is it! All additional requirements are drawn from available units out of a force pool. Within the UEy organization, 37 of the 50 engineer staff members reside in its sustainment directorate. With the scope and volume of engineer-related responsibilities assigned to the UEy, these engineer staffs are too severely undermanned to handle such a diverse load.

In the joint environment, we continue to experience a lack of synergy in planning, prioritizing, managing, and executing the joint commander's operational and strategic missions. No joint functional engineer headquarters exists for orchestrating theater-assigned units and activities throughout the region. Given the wide spectrum of tasks required, joint doctrine does not adequately assign responsibility to engineer theater-level operations. Not unlike the UEy, many of the theater-level

engineer missions become the responsibility of the logistics staff section (J4), which is fundamentally different and impractical from what is demanded of engineer support through the various phases of contingency operations.

In both of these cases, there is also a significant shortfall in the technical capability to conduct ongoing, constantly changing, and sometimes unique theater missions, particularly in the areas of major construction, infrastructure revitalization, real estate activities, and environmental support. Such expertise is usually brought from various sources, creating ad hoc entities and theater-wide gaps and redundancies with no central control or interface.

Alternatives

The following paragraphs offer several alternatives to the problem:

Engineer Brigade

A simple fix would be to augment the UEy and the joint headquarters with an engineer brigade to take care of this shortfall. However, the engineer brigade is an entity with a tactical, rather than an operational and strategic, focus. Nor is it designed with the technical capacity (breadth and depth) to plan and execute the disparate UEy infrastructure-enabling missions, whether in battle or in peacekeeping. There is also the issue of understanding and executing missions involving multiple services, contractors, other agencies, and the host nation. Clearly, we are talking about a totally different operating environment.

Engineer Command

Although originally designed as a C2 headquarters in support of a full-scale major contingency operation (MCO), ENCOMs, over the years, have developed unique and essential capabilities that have ensured theater-level success to ongoing operations. During both Operations Desert Storm and Iraqi Freedom, the 416th ENCOM led theater-level engineer efforts and is continuing the reconstruction support today. Based on the ENCOMs' long-standing planning efforts and habitual relationships with the unified commands, their unique ability to leverage and apply high-demand civilian/commercial engineering skill sets to military situations, and their senior-level breadth and experiences, they have emerged as invaluable force providers of specialized skills to support the operational commander in war or peace.

The ENCOM table(s) of organization and equipment (TOE) already charters them as the headquarters that commands and controls all Army engineer assets (to include other services and allied/coalition and contract construction) and provides engineer operational-level planning, supervision, coordination, and technical services supporting Army Service Component Command (ASCC) or joint task force (JTF) headquarters requirements. However, as has been seen elsewhere, missions and capabilities do not always match.

First, the ENCOM currently is an Army-only organization. Second, not all of the stated missions are covered with enough depth to successfully execute (for example, contract construction and topographic support). Third, it is organized and deployed based on a conventional war scenario, starting with a cross-disciplined early-deployment cell that later becomes overlaid with more of the same, but expanded, capabilities as the conflict escalates. In each phase, the ENCOM maintains its one-location, jack-of-all-trades posture. Any deviations on the employment requirements necessitates ad hoc task organizing: stripping out disciplines from existing teams. This organizational-employment pattern is not conducive to modularity and getting the right capabilities to the right place at the right time.

Field Force Engineering

On the other side of the coin are the USACE field force engineer (FFE) teams, who through recent events have brought invaluable technical engineering expertise into numerous situations, solving local- and national-level contingency problems. During both Operations Enduring Freedom and Iraqi Freedom, their forward engineer support teams (FESTs) have been materially involved supporting stability operations and support operations, as well as making significant contributions to combat operations. Through their experiences and expertise in national infrastructure engineer planning, design, and management, FESTs were responsible for the assessment, design, and planning of numerous base camps, logistics-base facilities, and transportation nodes and networks. They have the unique ability not only to work with outside agencies and other governments to accomplish their mission but also to reach back and tap into an immense pool of engineering experts throughout our nation to produce engineering solutions to any problem, no matter how obscure.

Although the USACE FFE teams have been working side by side with the military at numerous levels, they have not been a formal component of a unified effort. Technically, they are not a military organization. Many of the FFE teams are made up primarily of USACE volunteers who are assembled, as required, for deployment. There are no preestablished tables of distribution and allowances (TDAs) or TOE FFE organizations. The FFE support structure is basically taken out of hide to meet contingency requirements.

Solution

Together, the ENCOMs and the USACE FFE teams have much of the capability needed to fill the wide-and-deep capability gap requirements that are necessary to run theater-level operations. They complement each other in the capabilities and skills required to achieve the engineer support aspect of the joint commander's overarching objectives.

This author proposes creating a theater-level engineer organization that not only merges the unique existing capabilities of the ENCOM and USACE FFE organizations but also enhances the structural mix with joint-capable staffing

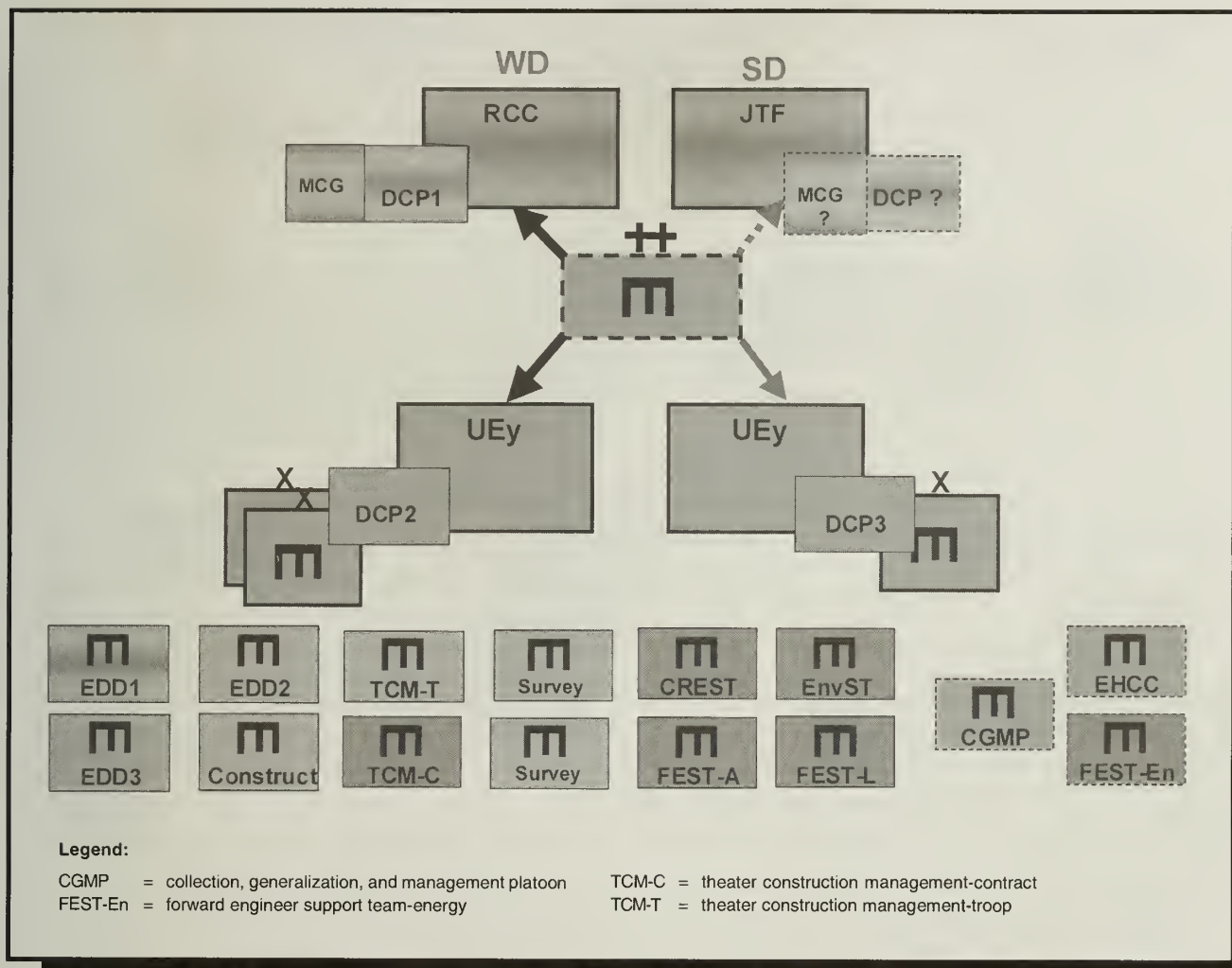


Figure 1. A Concept of Theater Engineer Contingency Support

and a modularized organization. This organization would be capable of supporting both a joint and an Army headquarters simultaneously, and perhaps independently, while providing the right technical expertise as the situation dictates. A single military organization, integrated with other services and organized in a modular fashion, could provide a powerful engineer multiplier to the theater commander.

Organization

Rather than combine the two entities and then tweak the results, a deliberate bottom-up approach needs to be taken to build a new organization. This consists of articulating the gaps, applying required capabilities to fill these gaps, and organizing these capabilities to ensure that the right amount of ordnance is delivered with a fair amount of precision.

Much of this work has already started. Gaps and capabilities have been documented. The personnel resources have also been broadly identified. However, what joint assets are needed to round out this new organization and to ensure that decision superiority that positively impacts all services can be achieved? How will they be integrated? And most importantly,

how does this new theater-level organization employ during contingencies to meet the changing requirements of a joint operation and an Army UEy operation at the same time or more than one operation, if required?

Having a working knowledge of the capabilities of engineers of the other services is paramount. Also, understanding how the other services operate is vital to orchestrating theater-level missions. Making decisions and planning the design of an air base, executing a logistics-over-the-shore operation, or effectively repairing a port requires firsthand experience that can only be achieved by embedding the right service skill sets into the organization—not as augmentation upon deployment, but as an ongoing practice. In other words, the organization needs to be joint from the start. Joint staffing of this organization must also be robust enough to cover any situation.

In order to provide the right engineer support at both the RCC and the UEy, while ensuring response to a second contingency, this author believes that this new engineer headquarters could be organized around three modules. These modules would consist of a joint mobile command group (MCG)

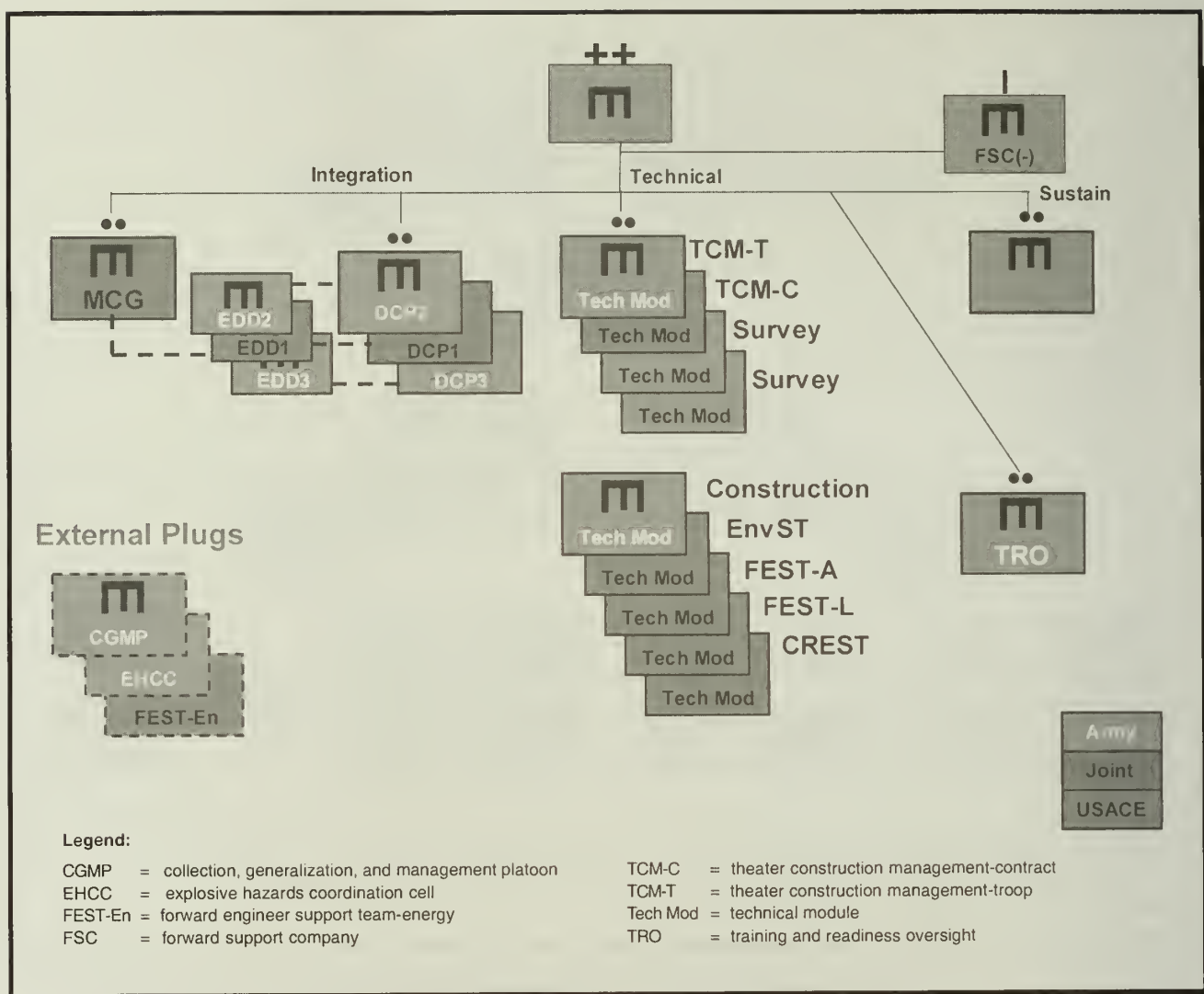


Figure 2. A Modularized Headquarters Organized for Support

and a joint deployable command post (DCP) for RCC support and two ASCC-/UEy-oriented DCPs. One DCP would support a win-decisively (WD) campaign, and the other would be used for a swiftly defeat (SD) campaign (or as a rotational asset). Technical modules from this organization would also be employed and moved to whatever level necessary to deliver engineering capabilities. In addition, already-established military, USACE, and civil organizations could be plugged in for augmentation on a temporary basis, if required (see Figure 1, page 57).

Within this organizational structure would be embedded technical USACE FFE modules as stand-alone entities, performing specific functions. Examples include contingency real estate teams (CRESTs), forward engineer support teams-advance (FEST-A), and environmental-support teams (EnvSTs). Other FFE capabilities and personnel would be absorbed into various staff elements throughout the organization, such as the forward engineer support teams-light (FEST-L) personnel becoming part of the early-deployment detachment (EDD) of the DCPs. Members from

other services would be incorporated into key and working-level staff positions throughout the organization. They would be heavily assigned in the MCP and RCC DCP and have a lighter presence throughout the rest of the organization, depending on the function (see Figure 2). For those organizations where augmentation is likely, training associations would be encouraged.

Conclusion

This author suggests this proposal as a starting point for further evaluation and analysis. All of the components that are discussed are necessary to solve the theater-level engineer capability gap. Is there a better solution? Probably. For the sake of the future, is this worth pursuing? Definitely!

Colonel Lago has had three ENCOM assignments, totaling almost eight years. He is the Deputy Assistant Commandant, US Army Reserve, for the US Army Engineer School, Fort Leonard Wood, Missouri.

THE FUTURE ARMY TACTICAL FIRE FIGHTING TRUCK

By Major Mollie Pearson and Mr. Michael Bonomolo

On 29 January 2005, the 406th Engineer Fire Fighting Detachment, 89th Regional Readiness Command, received the first M1142 Tactical Fire Fighting Truck (TFFT). This new fire truck replaces the 20-year-old Amertek, Incorporated, Military Adaptation of a Commercial Item (MACI) 2500L. The Army will purchase more than 100 of these new fire trucks over the next five years.

History

On 5 April 1974, the Department of the Army (DA) approved a Required Operational Capability (ROC) document for a family of fire fighting equipment. The ROC stated that this new type of TFFT would have the capability to combat three types of fires: structural (military buildings, troop housing, and storage areas), brush, and aircraft crash/rescue (small and intermediate). The determined materiel solution was the MACI 2500L, fielded from the early to mid-1980s.

The MACI, a commercial fire fighting vehicle adapted for tactical use, had its share of mechanical problems. It was unreliable and difficult to repair. A major contributing factor for the poor maintenance and lengthy repair times was that as the last MACI was fielded, Amertek divested itself of its fire truck production line. As a result, repair parts became scarce and often required off-line manufacturing. Second, the MACI's ability to effectively carry out only three types of missions was considered a limiting factor for the Future Engineer Force (FEF), which is expanding the fire fighting tasks from three to

five. A third factor was the truck's lack of water capacity. According to Army Regulation 420-90, *Fire and Emergency Services*, an aircraft rescue fire fighting vehicle must carry a minimum of 1,000 gallons of water to support Army tactical airfield operations. Air Force fire test site results, using empirical calculations adapted from the Federal Aviation Administration (FAA),¹ determined that tactical airfields supporting 46 missions or more per day—or servicing CH-47 aircraft or larger—require fire trucks with a water capacity of at least 1,000 gallons. Unfortunately, the MACI's lower water capacity of 660 gallons requires that there be two trucks on-station when supporting airfield operations.

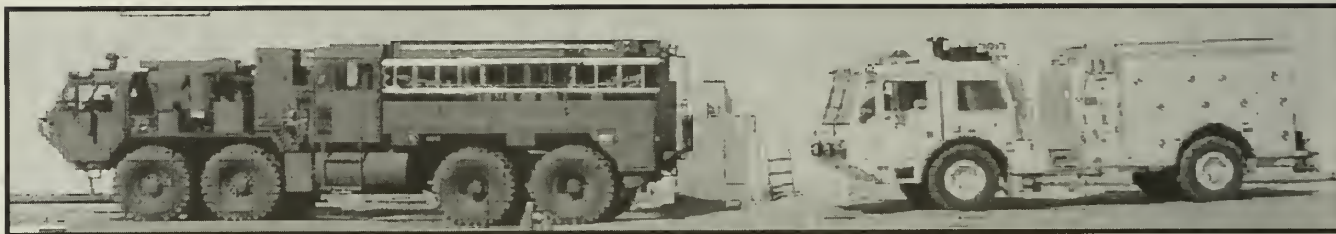
Development

In 1995, having read feedback from field units, personnel from the US Army Engineer School determined that the aging and unreliable MACI should be replaced. Before development could begin, a user requirements document was needed to justify the expense of purchasing a new fire truck. The document articulated user requirements to the materiel developer, who translated approved user requirements into a fire truck blueprint releasable to industry. The Engineer School chose to express its user requirements via a Statement of Continuing Needs in 1996 and 1997; two documents were drafted and subsequently approved in late 1997. The materiel developer then deciphered the user requirements into engineering standards that industry would understand—a Request for Proposal (RFP). In 1999, the materiel developer released the RFP, soliciting the design solution from industry.

The TFFT contract was awarded to Pierce® Manufacturing, Incorporated, of Appleton, Wisconsin, in mid-2000. The mobility Battlefield Operating System of the Army's Program and Objective Memorandum allocated no funding for research and development. Therefore, it was decided to use known components to put the TFFT together, and an Army heavy expanded-mobility tactical truck (HEMTT) was mated to a commercial fire fighting package. The project manager consulted subject matter experts (Army firefighters) from the US Army Training and Doctrine Command and the US Army Reserve about parts required, as well as field demands emplaced on a TFFT, to ensure the best design possible.



Passenger-side view of the M1142 Tactical Fire Fighting Truck



M1142 Tactical Fire Fighting Truck versus the Military Adaptation of a Commercial Item 2500L

It was decided early in the process that commercial fire fighting standards according to the National Fire Protection Association (NFPA) would be used as a guide, and strict adherence would not drive the development of the TFFT. There were many reasons for this. The TFFT is a multifunctional fire fighting truck envisioned to combat five types of fires/hazards encountered by firefighters in the field: wildland; structural (limited to two stories or less); petroleum, oil, and lubricants (POL) and hazardous materials (HAZMAT); tactical vehicle; and aircraft crashes. Designing the fire truck to meet all five missions to NFPA standards would significantly increase cost, require a larger vehicle, and increase engineering and development time.

Design Challenges

The TFFT user requirements challenged Pierce to come up with a unique design. Among the many technical challenges to overcome, the following were the most noteworthy:

Expanding the HEMTT crew-carrying capacity from two to six. Pierce placed an air-conditioned four-man crew cab just to the rear of the HEMTT engine. Communication between the driver's compartment and the crew cab is accomplished via a vehicular intercom system.

Providing the pump operator with an unimpeded 360-degree view of a fire or crash scene. The pump panel was placed forward of the four-man crew cab on top, facing toward the front of the vehicle. Access to the pump panel is through the crew cab's removable roof, and a recessed shelf provides a place for the operator to stand.

Sustaining uninterrupted water pressure to the outlets and water cannons for pump-and-roll capability, as the vehicle altered its speed. Coupling the 1,000-gallons-per-minute water pump to the transmission-driven power takeoff meant that less energy was received by the pump, which lowered the water pressure to the water cannons as the HEMTT slowed. Aircraft crash rescue techniques, or pump-and-roll, require the fire truck to maintain continuous water pressure to overcome the intensity of a fuel fire. Pierce surmounted this deficiency by adding a second engine, a 200-horsepower Deutz® pump engine, to exclusively power the water pump. It was located forward of the four-man crew cab just below the pump panel. The second engine can be started at any time and is not affected by the speed of the truck, assuring nonstop power to the water pump. There are maintenance access panels

on both sides and an inherent exhaust pipe, though fuel is drawn from the HEMTT's fuel tank.

Maintaining command and control among the TFFT crew, both for fire fighting and day-to-day operations. The TFFT was provided with a set of four frequency-modulated (FM) handheld radios and one cab-mounted, very high-frequency (VHF) base radio. This allows the on-site fire chief to communicate with his team at a fire or crash site. Communicating between the two cabs is accomplished via a Fire Com 3020R intercom set. Additionally, a Single-Channel Ground-to-Air Radio System (SINCGARS) provides command and control with the maneuver commander's forces.

Overcoming the front cab's narrow steps to accommodate the width of the firefighter's boot. The ability to modify the HEMTT chassis was limited by regulations. A human factors engineering modification was submitted by the Army Research Laboratory and is being evaluated as a general fix for all HEMTTs.

Overcoming the lack of comprehensive basic issue items/components of end items fire fighting equipment currently on the fire team's table of organization and equipment. The project manager purchased commercial-quality fire fighting equipment and made it part of the technical data package that is required to support the TFFT.

Storing the additional equipment procured for the TFFT in the limited storage areas. Pierce designed storage areas on both sides of the TFFT.

Operational Test

The TFFT was subjected to an operational test at Fort Huachuca, Arizona, from July to August 2003. An overall summary of the test reached this conclusion:

"Soldiers from four different Regional Readiness Commands from across the United States successfully used the TFFT to conduct all firefighting missions prescribed in the TFFT operational mode summary/mission profile (OMS/MP) during the Initial Operational Test. Missions consisted of structural fires, aircraft crash rescue fires, vehicle-HAZMAT fires, vehicle rescues, and wildland fires. Computer-controlled, propane-fed simulators were used to simulate the structural and aircraft crash fire missions. Both crews conducted each mission successfully during daylight and hours of darkness. Salvage vehicles were used to conduct the vehicle rescue and vehicle-HAZMAT missions. Both



Left, side view of current TFFT step; right, a view of the proposed larger step to accommodate the firefighter's boot.

*firefighting teams successfully executed these missions during daylight and hours of darkness. A 5-acre wildland fire was ignited in the local training area and successfully contained and extinguished by the two firefighting teams working in tandem. The TFFT proved to be highly mobile throughout the test and provided the soldiers with ready access to all equipment necessary to execute each mission. The soldiers were unanimous in their opinion that the TFFT is far superior to systems currently assigned to their units."*²

The Future

Fielding of the TFFT to the engineer fire fighting teams—all components—and to Ordnance Ammunition Company fire fighting teams will be completed in fiscal year 2007. Revisions to the DA-approved distribution schedule are being staffed at this time, with the revisions necessitated by the ongoing deployments and redeployments of engineer fire fighting teams.

The Project Manager (PM), Heavy Tactical Vehicles (HTV), is committed to providing soldiers the best possible equipment, consistent with the requirements of the Engineer School. As this system is fielded, the PM HTV will welcome comments from the field concerning product improvements or modifications for inclusion in future production or for consideration as field retrofits. Information on this feedback system will be provided to soldiers of gaining units during new materiel introductory briefings.

The Engineer School; the PM HTV; and industry partner, Pierce Manufacturing, Incorporated, have worked together over the last seven years to develop, build, test, and procure a fire fighting vehicle to meet the multiple, varied missions required of an engineer firefighter. With our combined teamwork, we have produced a TFFT unmatched in its abilities to support the Current and Future Engineer Force. 

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Mr. Bonomolo is a combat developer in the Directorate of Combat Developments, US Army Engineer School, Fort Leonard Wood, Missouri. He has had numerous assignments in the military as a company commander and platoon leader, as well as battalion maintenance office communications-electronics staff officer for both an armor and engineer battalion.

Endnotes

¹FAA Advisory Circular 150/5210-6C and the NFPA formula, Appendix A, National Fire Protective Association 418, pp. 418-9.

² Test Report for the TFFT IOT, test #2003-OT-E/CS-1960, HQ, US Army Operational Test Command (OTC), 19 September 2003.



Members of the 89th Regional Readiness Command with the Army's newest fire truck.



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Clear The Way

By Major General Randal R. Castro
Commandant, U.S. Army Engineer School



Hello again from Fort Leonard Wood, home of the Regiment. As I write this, I think of the many Soldiers in our Regiment and our Army who continue to fight this nation's war, and I want to tell you that I couldn't be prouder. Despite the difficulty of the mission, you are achieving success. To everyone: Thanks for your service.

Judy and I extend our thanks for a job well done and fond farewells to Jill and Brigadier General (BG) William H. McCoy. They are a great team, and we will miss them. BG McCoy has made a lasting contribution to our Regiment and has moved on to command the Gulf Region Division. The good news is that we have another great team here to carry on. Colonel (COL) Todd Semonite is now the Engineer School Assistant Commandant. We welcome him, his wife Connie, and their family to Fort Leonard Wood. Colonel Semonite comes to us from the Office of the Chief of Engineers at the Pentagon. We are glad to have him on our Team of Teams!

I want to honor the competitors of our first ever Best Sapper Competition. We had twenty-two teams compete in a grueling and technically challenging competition. Congratulations to Captains (CPTs) Anthony Barbina and William Boyd, 65th Engineer Battalion, Schofield Barracks, Hawaii, the Best Sappers for 2005. I'm sure we'll have many more eager competitors next year as we intend to continue this competition as long as we have engineers in the Army.

Let me take a few moments to address some of the concerns I've been hearing from our Soldiers in this great Regiment about their opportunities for professional development in our new structure. There is no better time to be an engineer than right now, not only because of our accomplishments but our opportunities as well. I understand that it is hard to see the engineer units disappearing from the divisional structure, but those engineer Soldiers are coming back in units, companies, and battalions—above the divisional echelon. This won't happen overnight, but we will see the Regiment grow significantly in the next 2 to 4 years. Our Army is changing from the Force XXI Army to the Modular Force, and our Regiment is changing to the Future Engineer Force (FEF) to meet the needs of this Modular Army. Our companies will be structured to achieve a particular effect for the Army—sapper/ combat, horizontal and vertical construction, topographic, clearing, bridging, etc.—with each company (or module) having the ability to operate independently. The good news—all battalions will have their own combat service support



capability which, for the first time in ages, is adequate for combat operations.

If you are a junior enlisted Soldier in the Engineer Regiment today, you have an amazing opportunity for continued promotion. Our sapper, bridger, and construction specialty requirements all increase in numbers from sergeant (SGT) through sergeant first class (SFC). Staff sergeants (SSGs) will serve in key leadership positions in company-size elements, to include squad leader and section sergeant, along with numerous staff positions within the Regiment. The position of platoon sergeant will still be filled with an SFC. The future is bright for

first sergeants too. FEF Modules support the standing up of additional vertical and horizontal companies, allowing Soldiers more opportunities to advance in rank. In addition, maneuver enhancement brigades, divisional staff positions, and engineer battalion staff sergeant major (SGM) positions coming back will add more positions for SGMs, affording greater opportunities for upward mobility from master sergeant to SGM. I expect to see an increase in the number of command sergeant major (CSM) positions available as we gain engineer brigades. This growth is expected due to recent changes to the span of control for the engineer brigades.

Warrant officers (WOs) will continue to be the technical officers of the Engineer Regiment. Most of this growth is within the topographic field, a six-fold increase in the next 6 years. Their assignments will develop along the full spectrum of the technical requirements to meet the needs of the FEF. WOs must also develop and maintain a tactical proficiency with the ability to lead and continue self-development education.

Over the next few years, our Regiment's need for lieutenants (LTs) will double. They will continue to serve in company-level positions to gain leadership experience, enhance technical and tactical competence and, when appropriate, complement this service with staff experience at the battalion level. Typical duty positions will still include engineer platoon leader, company executive officer (XO) or training officer in training center units, and battalion staff officer. With the addition of more engineer companies to the FEF, LTs will have more opportunities to have a first assignment as a platoon leader and gain tactical proficiency before their second assignment.

The increase in engineer companies will also increase the need for engineer CPTs to command those companies. CPTs should prepare for and seek company-level or certain types

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Lead The Way

By Command Sergeant Major Clinton J. Pearson
U.S. Army Engineer School



A great deal of change has occurred since the last issue of *Engineer*. We bid farewell to Brigadier General (BG) William H. McCoy and welcomed Colonel (COL) Todd T. Semonite as the Assistant Commandant of the Engineer School. I'd like to express my appreciation to the McCoy's for the positive impact they made on the Army, our great Engineer Regiment, and the Fort Leonard Wood community. We sincerely look forward to serving with COL Semonite and his family and feel blessed to have another extraordinary team in our midst!

I had the opportunity to visit the Soldiers, commanders, and command sergeants major (CSMs) in Iraq and Afghanistan and was able to capture events as they happened. Our Soldiers are performing at levels the enemy never would have expected, defeating them and winning the War on Terrorism. I would like to thank BG Bostick and CSM Gutierrez, command team for the U.S. Army Corps of Engineers® Gulf Region District, for the enormous amount of reconstruction the Corps has done; it is nothing short of a miracle. While the threats to America have changed, the need for victory has not. The entrenched enemies are using tools of terror and guerrilla warfare—yet we are finding new tactics and new weapons to attack and defeat them. Advanced technological development by itself is clearly not sufficient to ensure a successful military transformation. Leaders in our Regiment must ensure that we provide our Soldiers with the most advanced equipment and training possible. Proper training of our officers, noncommissioned officers (NCOs), and Soldiers remains the Army's top priority. I will highlight that and a few other priorities.

Training. The 1st Engineer Brigade continues to work on producing Soldiers who are prepared to arrive at their first duty assignment ready to immediately add value to the team and, in most cases, to deploy with their new unit. One key initiative in this process is the incorporation of a culminating exercise for both military occupational specialty (MOS) 21B/C One-Station Unit Training (OSUT) and Engineer Advanced Individual Training (AIT). These Soldiers participate in a scenario-based, squad Army Training Evaluation Program (ARTEP)-style exercise that tests their ability to perform Skill Level 1 tasks they have learned while performing engineer squad or platoon collective tasks in urban and complex terrain.

The 35th Engineer Battalion has completed several iterations of this exercise with positive results. Drill sergeants and leaders report that Soldiers come away with a greater understanding and appreciation of their ability to master engineer



tasks. Similarly, the 169th and 577th Engineer Battalions now conduct Battle-Focused Training (BFT) as a culminating 5-day exercise for engineer AIT MOSs. BFT is a 5-day exercise at Fort Leonard Wood for engineer AIT MOSs from Fort Belvoir, Virginia; Sheppard Air Force Base, Texas; and Gulfport, Mississippi. Replicating an intermediate staging base (ISB), Soldiers are issued equipment, assigned to squads, tested on their warrior tasks and drills, and led on missions that exercise their newly learned vertical and horizontal engineer tasks in a mission scenario. All engineer AIT graduates participate in military operations on urban terrain (MOUT), a convoy live fire,

and a second weapons qualification before shipping to their first duty assignment. The brigade continues to incorporate lessons learned and increase the rigor of training to provide the best engineer Soldiers possible to your units.

The 169th Engineer Battalion developed a new program called Soldier Trained and Ready (STAR). In the first 30 days of the program, the absent-without-leave (AWOL) rate has dropped, the number of Soldiers chaptered for discipline issues reduced, and the number of Soldiers chaptered for failing the Army Physical Fitness Test (APFT) has declined. The results of the 90-day pilot will be available for analysis at the August Initial-Entry Training (IET) Commanders Conference.

Transformation. The Counter Explosive Hazards Center (CEHC) here is conducting a Unit Searcher and Unit Search Advisor Course that is helping units learn to perform searches of occupied and unoccupied homes with skills incorporating search dogs in the mission. CEHC will be training the T-3 Counter Improvised Explosive Device (IED) Training Level 1, which will be combined with the Explosive Hazard Awareness Training and the Soldier Awareness Briefing. The second mine dog detachment is standing up with the Special Search Dog Course currently being conducted at Fort Leonard Wood, as well as having Soldiers at the mine dog training facility at Lackland Air Force Base, Texas. The detachment currently has dog teams deployed in Iraq and Afghanistan who are conducting clearing and search missions.

4-Tier Noncommissioned Officer Education System (NCOES). The transformed system now facilitates lifelong learning with guided self-development; reduces course length across the NCOES without degrading learning; supports Modular Force/ARFOEGEN; and expands experiential learning with increased situational awareness (agile leaders, common operating environment [COE], cultural awareness, lessons learned,

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(*"Clear the Way," continued from page 2*)

of detachment command. The goal is to allow engineer officers to serve in company command 18 to 24 months for continued professional development. The increase in the number of sapper companies in the FEF will afford CPTs a greater opportunity for company commands. Another important thing to remember is that while some of these companies are not within the divisions, the Modular Force will find many of these companies fighting within the division's battlespace when deployed.

Majors (MAJs) will have great responsibility in the Modular Army. Their greatest challenge and opportunities will be as brigade engineers, S3s, and XO's. Lieutenant Colonels (LTCs) will continue to have the option to command engineer battalions as well as brigade troop battalions. There is an overall increased need for both MAJs and LTCs.

With this development path and the structure of the FEF, we make the engineer COL the senior executive in our Regiment. We develop technical and tactical depth and breadth across the operational, institutional, and joint/interagency/international sectors of our Army. Officers will get promoted to LTC with great assuredness, and those who wish to seek command as field grade officers will posture themselves accordingly by completing the assignments that best prepare an officer for command—a balance of skills and experience. Although recent resourcing cycles have reduced our requirement for engineer COLs, ongoing analysis has approved a reduction in the span of control for the engineer brigade,

which should increase again the total number of engineer brigades in the force. The Army has realized the need for engineers beyond the capability left in the converted divisions. I encourage you all, especially the noncommissioned officers and company grade officers, to hang in through the next 2 years to reap the rewards of our growth. I say to you all: "We're coming back!"

For more detailed information, go to the Commandant's section of the Engineer School Web site at <http://www.wood.army.mil/eschool/> to view my video message and slide presentation on this subject.

I ask that you clear your calendars 24-27 October 2005 for the Army Engineer Association (AEA) Engineer Regimental Conference in Orlando, Florida. The event will combine a Council of Colonels (for a select audience) with a Warfighter Symposium for all who desire to attend. See the AEA Web site at <http://www.armyengineer.com/> for details. We look forward to seeing you there.

In closing, I want to ask your support. Our next issue of the bulletin will focus on Assured Mobility in Urban and Complex Terrain. We want to share your ideas, experiences, tactics, techniques, and procedures for what works to fill the gaps the Regiment has in this area. I look forward to reading your contributions.

Again, thanks for all you and your Team (to include spouses) are doing for our Regiment and our Army. Carry on!

Essayons!

(*"Lead the Way," continued from page 3*)

and conceptual learning). We are looking at giving our NCOs more skills and tools to operate on a joint staff at the senior NCO level. We are working both courses in concert with our training developers, and the schedule should be released in the next issue of *Engineer*.

With all the Army transforming, engineers will have an increase in the E-9 population. Before modularity, we had 59 E-9 positions that were directly related to combat structure divisional and echelon-above-division units. Additionally, we have about 43 E-9 authorizations in various other organizations. With our new design, we will have 77 E-9 positions, in addition to the other 43 authorizations. Also keep in mind that we are currently filling several BTB CSM positions. It is the Regiment's intent to get the approval for the following E-9 population in our new unit designs. In the future, four brigade headquarters are expected to have 5 E-9 positions (4 are CSM), 27 battalion headquarters x 2 E-9s = 54 (27 are CSM), 5 unit of employment-operational (Uey) x 1 E-9 and 13 in unit of employment-tactical (UEX) x 1 E-9.

We have top-notch CSMs who get nominated and selected to positions that are not reflected against our authorizations. We are also looking at making the maneuver enhancement brigade operations SGM an engineer. Bottom line: Our future as a Regiment is a great news story. Senior NCO leaders now need to project this to our young Soldiers. The E-9 increases

also apply to our National Guard and Reserve brethren though the number of their units varies. The expected growth also applies to the E-8 and E-7 population. With all that said, I would like to congratulate all the sergeants major (SGM) and master sergeants of Class 55 who completed the U.S. Army Sergeants Major Academy (USASMA). Well done!

We completed the first Best Sapper Competition among 22 different sapper teams from around the World. Congratulations to Best Sappers CPT Anthony Barbina and CPT William Boyd from the 65th Engineer Battalion. I would like to thank the leadership from the various units for supporting their Soldiers.

On my recent trip to Florida, I had the great pleasure of attending the dedication ceremony for Medal of Honor recipient Sergeant First Class (SFC) Paul Ray Smith (Sapper). The ceremony was attended by the Smith family, Florida Governor Jeb Bush, University of Central Florida President John C. Hitt, Lieutenant General Carl A. Strock, and other dignitaries. In honor of SFC Smith, the Simulation and Training Technology Center (STTC), Orlando, Florida, was renamed the SFC Paul Ray Smith Simulation and Training Technology Center to recognize his extraordinary heroism and uncommon valor.

Finally, continue to focus on the Global War on Terrorism, maintaining high standards and leading the way as engineers do. May God bless the fallen comrades and keep watch over our sons and daughters as we continue to fight the fight. Essayons!

Expeditionary Engineer Mission Force

By Lieutenant Colonel Michael P. Crall

On a cold day in March 2004 at Fort Bragg, North Carolina, a telephone rang in the headquarters of the 27th Engineer Battalion (Combat)(Airborne), and a voice on the other end outlined a requirement to enhance the maneuver of a joint task force (JTF) that was taking the fight to the enemy along the Afghanistan-Pakistan border. The mission was to rapidly deploy by air with a tailored battalion engineer mission force (EMF) to construct a forward operating site (FOS) in a remote area of Afghanistan. Site capabilities must include a C-17 airfield with the ability to land several C-17s simultaneously, accommodate several rotary-wing aircraft, and include a matted taxiway; an 80,000-gallon forward area arming and refueling point (FAARP); and a base camp.

"Can you do it?" asked the JTF liaison officer (LNO). "And by the way, this is a nonpermissive environment, the road network is virtually nonexistent, you must have an airstrip that allows a short takeoff and landing (STOL), and your mission force must secure itself."

"Sounds like a challenge. But why the Tiger Battalion?" asked the command representative.

"I forgot to mention that the only way to get the engineer equipment in there is by parachute," responded the JTF LNO.

"Our motto is, 'To do all things well'," replied the command representative. "When do we leave?"

And so began the short-fuse planning to establish FOS Carlson in Afghanistan, with the goal of providing the supported JTF freedom to maneuver and operate in this austere, high-altitude region; it was expeditionary engineering at its best.

Versatility

The 27th Engineer Battalion had been supporting the Global War on Terrorism on many fronts since 11 September 2001. Having provided support to the 3d Ranger Battalion, 75th Ranger Regiment, during an airborne seizure of an airfield in Iraq and an area mine-clearing mission for the Combined Joint Task Force-180 in Afghanistan, the battalion was now supporting the 82d Airborne Division in



A C-17 taxiing on the ramp parking area

Iraq and a U.S. Southern Command mission in Honduras. To execute the new mission, an engineer force had to be organized—using the uncommitted battalion assets and JTF combat enablers/forces—to form a combined arms team that could secure the terrain and construct and sustain an FOS.

The multifunctional engineer capability and deployability of the corps combat airborne organization made the 27th the unit of choice to form the nucleus of the mission force. With each line company consisting of two combat engineer platoons, a light equipment platoon, a maintenance section, and a headquarters section, flexibility is a hallmark of the force structure. Additionally, the Headquarters and Headquarters Company includes a vertical construction platoon, a medical section, a support platoon, an organizational maintenance section, a direct-support maintenance section, and staff elements that add to the battalion's multifunctionality. The deployment capabilities are also critical: an ability to strategically deploy by air, conduct a parachute insertion of equipment and personnel, and tactically move personnel and equipment by rotary-wing assets.

Given the mission requirements and assets that were deployed to support other missions, an EMF using the available assets was essential. The troops that were to design



Paratroopers onboard a CH-47 en route to secure the DZ

the force began by using specified tasks, which were refined based on requests for information and intelligence, surveillance, and reconnaissance (ISR) data gathered from the task force. The EMF-specified tasks were to—

- Protect the force.
- Rapidly deploy by air to multiple intermediate staging bases (ISBs) in Germany and Afghanistan.
- Conduct a rotary-wing assault to secure a drop zone (DZ).
- Execute a parachute drop of an airfield construction package by C-17 aircraft.
- Employ a ground assault convoy (GAC).
- Construct a STOL airstrip; upgrade to C-130 assault landing zone (ALZ) capability.
- Construct a C-17 ALZ, taxiway, and cargo ramp.
- Construct a heavy landing zone taxiway with AM2 matting and staging area.
- Construct an 80,000-gallon FAARP.
- Construct a base camp with life support.
- Provide command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); force sustainment; and JTF liaison.
- Provide engineer support to the JTF.

With the remaining uncommitted battalion assets, the EMF was formed around the battalion headquarters, Charlie Company, and Headquarters and Headquarters Company. The EMF task breakdown was evident: Charlie Company would secure the force, Headquarters and Headquarters Company would build and sustain the FOS, and the battalion headquarters would provide C4ISR and liaison to the task force.

Additionally, the task force provided combat enablers to operate as a combined arms team to include a U.S. Air Force Special Tactics Squadron for the Air Traffic Control, joint fires, tactical unmanned aerial vehicles, and an ALZ assessment; an information operations team; a civil affairs team; a FAARP team; an air liaison officer; a joint communications support element; and an embedded British Broadcasting Corporation/public affairs team. On order, the task force would provide additional combat forces for both fire support and ground maneuver, as the threat evolved.

Deployability

With the personnel and equipment ready, plans refined, equipment rigged to airdrop, and mounted rehearsals completed on similar terrain at Fort Bragg, the EMF deployed via C-17 to the ISB at Baghram Airfield, Afghanistan, while C-17s with the airdrop engineer equipment staged at an ISB in Germany. Because of the time-sensitive nature of the mission, a battalion assault command post was sent to Baghram Airfield to refine the plan as the force closed. Since there was no time for a predeployment site survey, the task force focused ISR assets to facilitate battlefield visualization. This included not only the enemy situational template but also detailed terrain analysis along with in situ soil conditions to ensure that we could construct the FOS—specifically the ALZ. We had detailed digital terrain products of the area, which allowed us to see the battlespace and effectively array initial-entry security forces on the objective. Refinement of the EMF occurred until the wheels went up on the last aircraft to ensure package fidelity based on the ISR pull. With a limited number of deployment aircraft, all C-17s were filled to maximum capacity. This constrained airlift drove the organization of the EMF considerably, requiring the right mix of equipment and personnel to execute the mission with

the proper redundancy—especially with the airdrop of equipment.

The additional task force assets were integrated into the EMF as final troop-leading procedures took place. Reception, staging, onward movement, and integration (RSOI) and force closure at Baghrum Airfield took 3 days, giving paratroopers a chance to get acclimated and perform final precombat checks and inspections and rehearsals. Refinement of the plan continued with the task force—specifically the rotary-wing assault and airdrop operation—to ensure the survivability of the platforms into the small DZ, which was surrounded by wadi complexes and 6,200-foot ridgelines. Back briefs and rock drills of the plan were provided to the JTF commander to ensure the seamless synchronization of fires, C4ISR, and maneuverability. The evening before initial entry, paratroopers gathered around a football-field-size terrain model of the objective to view the final rock drill. The stage was set; the force, ready; the weather, ideal; and all understood the task and purpose of the mission.

The EMF deployed to the objective area by rotary-wing assault, GAC, heavy-equipment airdrop, and airland operation. Battalion personnel boarded CH-47 and MH-53 aircraft for the initial entry. Tasks of the initial-entry force were to secure the objective area, establish the DZ, and lay out the survey control points for the airstrip to facilitate construction of the ALZ. AH-64s were added to the initial-entry package to provide in-flight security, as well as to clear the objective landing zone. MH-47 aircraft were scheduled to bring in Class I and IV provisions to support the force.

Initial assault was executed unopposed. Upon landing, Charlie Company established blocking positions to secure the DZ, while the survey team established the ALZ geometry. The

battalion assault command post established secure voice and data communications with the task force while controlling ISR and close air support assets to support initial-entry security operations. Heavy drop of the engineer equipment was planned for after the assault—once the DZ was established and secured, the ALZ surveyed, and the light equipment derig teams staged.

On 25 April 2004, a heavy airfield construction package was airdropped from C-17 aircraft onto a 2,000- by 800-foot DZ 6,000 feet in elevation—the largest heavy drop of engineer equipment since World War II. All platforms landed safely due to the precise planning of heavy drop points of impact by the task force airlift planners, the EMF, and the Air Force Special Tactics Squadron. One grader was nonmission-capable due to three flat tires, but all the other equipment was fully mission capable. The airdrop was supported by robust fires and an ISR package to ensure C-17 survivability and the security of the ground force. Following the airdrop, derig teams swarmed to the marked platforms, expertly removing parachutes, lashings, and rigging. Forty-three hours after the last platform was derigged, a STOL Air Force aircraft landed on a newly constructed ALZ—a credit to the detailed planning, preparation, and execution of the initial-entry force. FOS Carlson was beginning to take shape. The JTF commander now had more flexibility to operate in this remote border region.

Simultaneously with the pickup zone of the initial-entry force, a GAC departed from Baghrum Airfield with several wheeled vehicles. The route was more than 300 kilometers through severely restricted terrain and areas that had strong anticoalition militant (ACM) support. Each vehicle had a crew-served weapon. More than 120 personnel were in the convoy, making it a force to contend with. It was also equipped with



**ALZ construction
12 hours after the
airborne operation**



The ALZ evolution: left, Day 1; right, Day 90, C-17 capable

the Engineer Research and Development Center Automated Route Reconnaissance Kit to assist in navigating and documenting the route. The convoy encountered traffic ramming and attempts by local personnel to board the vehicles as they passed through downtown Kabul. Unfortunately, the international security force that was tasked to man traffic control points in Kabul was called away, responding to an improvised explosive device (IED) in another part of the city. Nonlethal force and speed ensured that the convoy's passage through Kabul was successful.

After the convoy encountered additional armed groups along the route (which required that the armed personnel be detained until a coalition force arrived to verify their legitimacy), it continued through the restricted terrain. Ambushed at a choke point, the convoy focused direct fires and called for close air support to neutralize the ACM four-point attack. Through fire, maneuver, and focused air support, the militants were destroyed with no damage or injury to the convoy, and the convoy proceeded into the objective area, linking up with the initial-entry forces.

Lethality

The EMF continued to secure the objective and expand the STOL ALZ to C-130/C-17 capability. Charlie Company established platoon battle positions and a series of observation points and traffic-control points, which allowed the light-equipment platoons to operate continuously. Sappers dug in and arrayed weapon systems to defeat a direct attack or to survive an indirect attack. Traffic-control points were established due to an unimproved road passing through the objective area. This road was used by ACMs as an infiltration route to and from Pakistan and by locals passing

through the region. Traffic control on the road was essential to the security of the area. Mounted and dismounted patrols; area-of-operations presence patrols; and aggressive shows of force synchronizing direct, indirect, and aerial fires were executed to prevent ACM attacks or infiltration via the FOS. The decisive operation, however, became the expansion of the STOL ALZ to allow the task force to conduct operations from the FOS. One light-equipment platoon constructed the C-130 ALZ, while another one constructed the helicopter taxiway, landing zones, and FAARP. The S3 of the technical and survey section stayed 24 to 48 hours ahead of the constructive force to finalize site layout of the ALZ, taxiways, and base camp.

As the ALZ was being expanded, the platoons encountered numerous obstacles. No water was available within 10 kilometers, and the extremely large rocks in the silt/sand material made soil strength readings difficult. Although the STOL airstrip was constructed without water, achieving the required C-130 and C-17 soil strength and surface functionality required several thousand gallons of construction water per day. A recon of an area 3 kilometers south of the site yielded a potential water source in a wadi under a lime rock outcropping. After digging a 6-foot-deep hole with a small emplacement excavator, water pooled, which allowed a water distributor to upload and deliver water to the site. The cycle time was one hour per 2,500 gallons, requiring this equipment to initially run continuously, with a mounted security force protecting the route and upload site.

Because of the large rocks that were 2 to 6 feet below the surface, dynamic cone penetrometer (DCP) readings used to determine the soil bearing capacity of the ALZ became a concern. Engineer Technical Letter 01-6 (published jointly by

the Army and Air Force) defines the standards for which small austere airfields (SAAFs) are built.¹ These standards include not only dimensional requirements but also soil strength requirements. High, potentially inaccurate DCP readings became a concern of the Air Force Special Tactics Squadron, who believed that the strength of the soil between these large rocks would not support C-130 loading. Although the EMF was experienced in ALZ construction and deemed it ready for landing, a consultation was required to determine the way ahead. Using a TeleEngineering Kit to conduct a video teleconference with the Engineer Research and Development Center in Vicksburg, Mississippi; the Air Force Civil Engineering Support Agency at Tyndall Air Force Base, Florida; and FOS Carlson, it was determined—based on analyzed data—that the ALZ was suitable for both C-130 and C-17 landings. The EMF continued construction, culminating with the assault landing of a C-130 after 2 weeks on the ground.

Simultaneous to the construction of the ALZ, the base camp began to take shape. More than 100 truck loads of a joint operational set (JOS) base camp—which included inflatable shower facilities, cots, and tents (to be used as a mess hall, a gym, an aid station, and for command and control)—and essential classes of supply were scheduled to arrive beginning on Day 3 and continue throughout the buildup. Unfortunately, the first trucks did not arrive until Day 14, requiring the sustainment of the FOS by a combination of containerized delivery system C-130 parachute drops, CH-47, and airland aircraft to bring in water, food, and fuel daily. The vertical construction platoon initially served as the assault command post security force, but with the arrival of the JOS by truck, began the construction of the base camp. With the completion of force-protection berms, initial guard towers, and bunkers, the EMF moved from foxholes to environmentally controlled Alaskan tents by Day 24—a major improvement to force protection and quality of life, especially since the temperature at the FOS reached 120 degrees Fahrenheit daily.

By Day 30, the JTF could project combat power from an expeditionary FOS to conduct operations in Afghanistan. The site was now capable of landing C-130 aircraft, parking rotary-wing aircraft on an AM2 matted taxiway, fueling rotary-wing aircraft from a 40,000-gallon FAARP, and sustaining additional personnel with quality-of-life enhancements.

Sustainability

The bottom line was that the EMF had to support (fuel, fix, feed, and sustain) itself and additional forces. This was achieved with the flexible design of the EMF and the push of logistics from the liaison team at Baghram Airfield. Due to the remoteness of the area, the maintenance platoon and the support platoon were essential to the mission success. Combining the two company organizational maintenance sections and the battalion direct-support maintenance section into one platoon, the maintenance platoon was able to sustain the equipment under harsh conditions—even with the supply

hub hours away by air or days away by ground through ACM country.

The support platoon was split between the FOS and Baghram Airfield to push and receive essential supplies. The liaison team gathered the necessary supplies and pushed them via air or ground to the FOS. Due to the uniqueness of the airborne engineer equipment, reachback to Fort Bragg became essential for Class IX supplies not available in Afghanistan; just-in-time logistics took on a new meaning. Initially, a tailored Class II/III/V/IX package was airdropped during entry operations that sustained the force until linkup with the GAC. Long lead times became the norm, but the innovation of the sustainers ensured that the operation continued with no significant shortfalls. After Day 30, the base camp provided bare-bones beddown for personnel with the erection of the JOS. As trucks continuously arrived—bringing additional equipment, construction materials, and supplies—the vertical construction platoon upgraded facilities to increase quality of life and force protection.

Due to the location, finding contractors to provide basic services became impossible. Most contractors were located in Kabul, Baghram, or Kandahar and wanted nothing to do with this region. Engagement with local elders led to the hiring of laborers, water tankers, and farm tractors with trailers to augment the EMF equipment. Laborers performed tasks such as filling sandbags, burning excrement, emplacing AM2 matting, erecting tents, and removing rocks from the ALZ surface during grading operations.

Farm tractors with trailers hauled clay material to sites on the ALZ to augment the fill effort and hauled gravel from local dry riverbeds to use in the base camp and between the rotary-wing parking areas for dust control. Water trucks topped off multiple 20,000-gallon storage bags, providing the daily construction water and nonpotable water requirements. At the height of the operation, the FOS employed more than 100 local nationals, 60 tractors, 10 water trucks, and 10 pickup trucks; this economic boost to the local economy had a secondary impact—force protection. Because of this, an assistant S3 officer and noncommissioned officer were dedicated full time to orchestrate the local labor, equipment support, and contracting. The FOS became the “employment factory” for the area.

Flexibility

The area of operation was relatively small, nestled in the middle of an east-west ACM infiltration route in the porous border region of Afghanistan. Multiple dismounted ACM recon patrols, attempting to assess force disposition, approached the FOS through the wadi complexes but were defeated after brief exchanges of direct fire and airborne fires. Although the primary tasks were to build, sustain, and secure the FOS, the ability to increase security in the entire area was essential to force protection. The plan was to engage the local government and tribal elders by establishing



Soldiers examine captured enemy weapons and ammunition

weekly council meetings to discuss issues and promote coalition information operations themes, demonstrate military resolve through shows of force and presence, and economically tie our force protection with local prosperity.

This engagement plan required an engineer staff to function as a combined arms battlestaff, integrating all Battlefield Operating Systems to develop executable combat plans and orders. Raids, village cordon and searches, civil affairs village assessments, the Medical Civic Action Program (MEDCAP), mobile traffic-control points, and weapon and ammunition cache seizure/destruction were the typical operations conducted by the EMF outside the FOS. The destruction of captured enemy ammunition became a weekly task for Charlie Company, who destroyed a total of more than six tons of rockets, mines, mortars, artillery rounds, demolitions, and small arms ammunition. Nightly, FOS security battle drills (integrating direct fire from guard towers, observation points, and the quick-response force with the mortar team and aerial fires) not only kept skills sharp but also sent an audible message to the local populace not to come near the FOS.

Although not a specified task for the EMF, polling-site security for the Afghanistan presidential elections became an implied task turned essential, due to our engagement in the area. Another coalition force was tasked for election security, but local elders and voting officials turned to the EMF to secure the polling sites. In conjunction with additional coalition forces, the EMF successfully secured twelve polling sites without incident. Flexibility became the hallmark of the operation: combat engineers executing infantry tasks or destroying enemy ammunition; equipment operators using bucket loaders with forks to download C-130s; supporters refueling MC-130s or MH-53s; mechanics welding fortified

post gates; or tactical operations center noncommissioned officers synchronizing JTF ISR assets to see battlespace in real time—adaptive, innovative leaders and Soldiers thinking in three-dimension and making it happen.

Conclusion

By Day 120, the FOS was built to the master-plan standard, and the 27th Engineer Battalion facilitated the assault landing of a C-17. The battalion had successfully shaped terrain to enhance the maneuver of the JTF, and the FOS enabled JTF combat operations in this remote region of Afghanistan at a time and place of their choosing. The success of this operation was due to three factors: the Warrior Ethos of the airborne engineer Soldiers, the versatile organizational structure of a corps airborne engineer battalion, and aggressive engagement in the area of operations. The paratroopers of this task force overcame seemingly insurmountable odds to execute this operation. Their drive, spirit, and tenacity shaped this piece of terrain into a force projection platform, enabling the JTF to take the fight to the enemy. The future expeditionary engineer force—it's here, it's now, it works.



Lieutenant Colonel Crall is the Commander of the 27th Engineer Battalion (Combat) (Airborne) at Fort Bragg, North Carolina.

Endnote

¹Engineer Technical Letter 01-6, *Contingency Airfield Pavement Specifications*, 12 June 2001.

Rebuilding Baghdad: An Engineer Battalion's Contribution

By Lieutenant Colonel Brian L. Dosa, Major Brian J. Davis, and Captain Brad A. Morgan

The 8th Engineer Battalion deployed to Baghdad for Operation Iraqi Freedom from March 2004 to March 2005. Although the unit performed a wide range of combat engineer and security tasks, its primary mission was to rebuild the infrastructure and restore essential services in the two districts covered by its brigade combat team (BCT). The reconstruction contributed to 1st Cavalry Division's objective of creating a stable and secure environment in Iraq. During its deployment, the battalion completed more than \$15 million in projects and turned over another \$35 million of ongoing work to the 3d Infantry Division.

Goals

Rebuild the Infrastructure

Focusing on sewer, water, electrical, and trash (SWET) projects, the battalion worked to restore essential services in its area of Baghdad. The existing systems had suffered from years of neglect and were seriously degraded or non-operational. Many neighborhoods were without functioning sewer systems, reliable electricity, clean drinking water, or trash collection services.

Empower Iraqis to Rebuild

The battalion quickly learned that Baghdad's engineers and officials knew the problems—and the solutions—but lacked the resources and organizational structure to fix them. The goal was to work with the Iraqis to rebuild their country—not impose American solutions to their problems. After all, the Iraqis would have to maintain the projects long after the battalion left the country.

Provide Work for Iraqis

An important part of creating stability was reducing unemployment. These infrastructure projects created numerous local employment opportunities, stimulated the economy, and reduced the ability of anti-Iraqi forces to recruit.

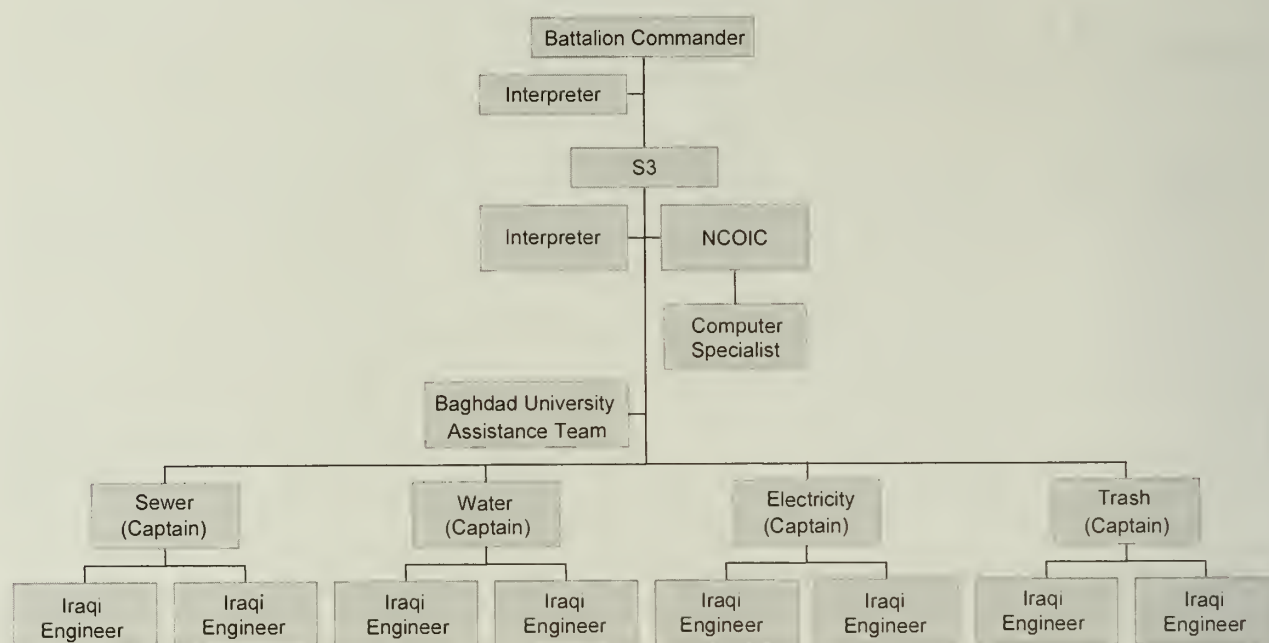
Show Immediate Progress

Since the rebuilding of Iraq's infrastructure would be a long endeavor, it was critical to demonstrate the battalion's plan and show its commitment to the task. As the project progressed, the Iraqi people were able to see their quality of life improving. This also built confidence in the interim Iraqi government and reduced support for the insurgency among the general populace.



Iraqi contractors construct a new high-tension line in Baghdad.

Infrastructure Coordination Element Organization



Organization

The battalion established an infrastructure coordination element (ICE) (see the figure above) from within its S3 section that was composed of four engineer captains (each responsible for one SWET focus area), a non-commissioned officer in charge (NCOIC), and a computer operations specialist. The battalion also employed a staff of ten local Iraqi engineers and interpreters. The battalion commander and his personal security detachment conducted most of the coordination with city and district leaders. Baghdad has an organized system of public works. Each of the nine city districts has a public works director general who has sewer, water, and solid waste superintendents and a staff. In addition, there are established departments at Amanat Baghdad (city government) for SWET. Although most of these departments are staffed with capable engineers and staff, sometimes they are not able to make significant progress on their own.

Contributions

The battalion's biggest contribution was its mission focus and project management skills. The ICE officers fully embraced the reconstruction mission and worked with Iraqi engineers and local leaders to establish priorities and organize efforts. The battalion leadership, drive, and project management skills proved invaluable throughout its tenure in Baghdad. The battalion was able to access all levels of the ministry and city government directly with the help of the 1st Cavalry Division's Governance Support Team.

The battalion played a critical role in securing funds required to start reconstruction. Amanat Baghdad did not have the resources to conduct routine maintenance and repairs, let alone start large improvement projects. Although the interim Iraqi government received funds from international donors, the funds were not available at local levels. The battalion was able to obtain the necessary funding from a variety of sources, including the Commander's Emergency Relief Program, appropriated funds, and donated international funds. While money was available to perform this critical work, time and effort were required to communicate the needs and commit the funds.

The battalion worked to ensure that projects were not based on political or personal gain. It targeted projects for the parts of Baghdad that posed the biggest security challenges. Not surprisingly, these areas had some of the worst services, and the residents lived in substandard conditions. As a result, a greater percentage of funds was applied directly to actual construction.

Project Management

Development

Because the battalion's focus was on SWET, most projects were identified by district and city engineers. The battalion commander interfaced directly with the district councils in weekly meetings and received input on the required work and priority areas. Landowning task forces worked with neighborhood councils on non-SWET projects such as school and hospital renovations. Iraqi engineers at the city and

**A new sewer
main line in
southern
Baghdad
improves the
Iraqi quality
of life.**



ministry completed designs and plans, thus ensuring continuity, synchronization, and adherence to Iraqi standards and specifications. The battalion's BCT deliberately focused resources on the areas where the insurgency was most active. The commander's intent was to bring kinetic and nonkinetic operations to the enemy simultaneously, in order to defeat anti-Iraqi forces and eliminate enemy support from the local population.

Contractor Selection

Reconstruction projects were completed by Iraqi contractors who employed Iraqi workers. The ICE held regular bidding conferences to announce and distribute bid packages for upcoming work. The battalion found that simple and standardized packets, in both Arabic and English, were essential to solicit clear and accurate bid proposals. Contractors also appreciated the use of compact disks and e-mail, which helped them increase their computer skills. After receiving the bids, the battalion formed selection committees to choose the best contractor for the job. The committees consisted of a city engineer, a district engineer, a local council member, and officers from the corresponding task force and the battalion. Selections were based on the contractor's previous experience and his local labor and security plans—not just the lowest bidder. Since many of the projects were located in dangerous parts of the city, the contractor's security plan and commitment to use local labor were often the difference between success and failure.

Quality Control

Quality control was an Iraqi responsibility. This was normally accomplished by a team responsible for day-to-day

project oversight. The team consisted of engineers appointed by Amanat Baghdad and district and Iraqi engineers. The battalion and the director generals were responsible for quality assurance. A team of engineers from Baghdad University also conducted quality assurance inspections. In some areas, project visits were not always possible due to security concerns. Since most of the contractors worked under the pretext of Amanat Baghdad, regular site visits would have jeopardized their safety. Reports from the contractors and the quality control teams were submitted at weekly project coordination meetings. These meetings were invaluable in coordinating for local labor and security and interfacing with neighborhood residents.

Visibility

The battalion ensured that the local populace was informed about the ongoing reconstruction in their neighborhood. The battalion Public Affairs Officer coordinated for media coverage, which ranged from local to international media. Regular coverage included contract-signing, groundbreaking, and ribbon-cutting ceremonies. District and neighborhood council members, along with Amanat Baghdad and district engineers, were encouraged to attend these events and interface with the media. Although the ceremonies were occasionally bumped, there was very positive media coverage in Iraqi newspapers, television, and radio.

The battalion also presented regular project status reports at the weekly district council meetings. This kept council members informed, helped develop local ownership of ongoing construction, and furthered the goal of getting the word out to the people about the reconstruction.

Lessons Learned

- Involve stakeholders in the entire project process. Iraqis want to rebuild their country, and giving them ownership—from project identification to contractor selection to construction oversight—further the goal of creating stability and security.
- Work reconstruction operations simultaneously with combat operations. Applying both kinetic and nonkinetic operations improved both security and quality of life in two of the worst neighborhoods.
- Ensure that project designs are synchronized with the city plans. In most cases, the Amanat Baghdad prepared the SWET designs; however, in some cases the contractor completed the design and received city approval before execution.
- Bureaucracy with local government and ministries is unavoidable, but including them in the beginning helped gain their support. Government officials can help or hinder—depending on how and when they are included—so identify the “power brokers” early.
- The ministries and Amanat Baghdad have capable engineers, but it is important to check the designs and bills of material before putting a contract out for bid. Specifically, review the scopes of work and define contractor and city responsibilities.

Sheikh Maruf Project

One of the most difficult neighborhoods was Sheikh Maruf—located about two miles north of the International Zone and plagued by gangs, criminals, and terrorists. Haifa Street, the main road through the area, was the scene of numerous attacks and assassinations. Sheikh Maruf contained approximately 250,000 people. The citizens were extremely poor, often living in buildings that should have been condemned. The area, known as the “Old City,” was built in the early 1900s.

The battalion learned of the poor living conditions during its first visit to Sheikh Maruf. Escorted by a local sheikh, the unit trudged through ankle-deep sewage that flooded entire neighborhoods. Since there was no sewer system in place, household sewage flowed down the middle of the street. The battalion decided that this area needed its attention right away, so it requested designs and bills of material from the Amanat Sewer Department and began fighting for funds for the project.

The battalion secured more than \$11 million from donated and appropriated funds to execute new sewer collection networks for the four worst neighborhoods in the Sheikh Maruf area. As part of the new sewer construction, the battalion also

rehabilitated the major sewer lift station. Committees selected contractors who were willing and able to complete the work, using the maximum number of local workers.

Because of the frequent attacks in the area, the battalion's ability to visit the area was limited. A quality control team composed of Amanat Baghdad and battalion-hired Iraqi engineers handled the oversight of day-to-day operations. The battalion conducted weekly progress meetings, which helped identify and solve problems. Neighborhood representatives were invaluable to contractor security, local labor coordination, and communication with the other residents.

Construction began in early August 2004 and was completed at the end of March 2005. The Iraqi contractors worked through numerous raids and other combat operations that were conducted in the area. In total, these projects employed more than 1,000 Iraqis, most of them from the very same neighborhoods. The residents realized several benefits: improved services, greater employment opportunities, and improved security.

Conclusion

The 8th Engineer Battalion's reconstruction efforts restored essential services to more than a million people in two districts of the city. The battalion saw Iraqis take ownership of the rebuilding process, which will pay dividends in the years to come. Showing immediate and visible progress garnered the support of the new government and encouraged patience among the people as major infrastructure work continues. Thousands of Iraqis contributed to the economy, also reducing the insurgency base of support. Although much work remains, reconstruction and restoration of essential services are well on their way. 

Lieutenant Colonel Dosa commands the 8th Engineer Battalion, 1st Cavalry Division. His past assignments include Commander, B Company, 8th Engineer Battalion; S3, 937th Engineer Group; and executive officer, 70th Engineer Battalion, 1st Armored Division. He is a graduate of the United States Military Academy, Cornell University, and the Command and General Staff College.

Major Davis is the S3 of the 8th Engineer Battalion. His past assignments include Commander, Headquarters and Headquarters Company, 588th Engineer Battalion, and platoon leader and executive officer assignments in the 1st and 70th Engineer Battalions. He is a graduate of Virginia Tech, the University of Missouri-Rolla, and the Command and General Staff College.

Captain Morgan is the construction officer of the 8th Engineer Battalion. His past assignments include platoon leader and executive officer of Alpha Company, 8th Engineer Battalion. He is a graduate of the United States Military Academy.



U.S. ARMY CORPS OF ENGINEERS SUPPORTS AN ARCTIC MISSION

By Dr. JoAnne Castagna

Up north near the Arctic Circle is Greenland, a province of Denmark. Greenland is the world's largest island, slightly three times larger than Texas. It sits 900 miles south of the North Pole, between northeastern Canada and Europe. More than 80 percent of the sparsely populated island is covered with flat, sloping ice caps and small glaciers. In the northwestern corner of Greenland, in a coastal valley nestled between two mountains and surrounded by miles of icebergs and glaciers, is Thule Air Base, the northernmost U.S. military installation. *Thule* (pronounced "Two Lee") is Latin for "northernmost part of the inhabitable world." The air base is home to hundreds of personnel, including active duty Air Force members, U.S. contractors, and Danish and Greenlandic personnel.

In this remote area of the world, you will also find personnel from the U.S. Army Corps of Engineers® (USACE). They volunteer to stay at the base, for months at a time, to supervise new construction and renovation projects that keep the installation fully operational and mission-ready. Some USACE projects have included an aircraft runway and taxiway, new living quarters, a firefighting training facility and, most recently, a new medical center.

Earlier this winter, Thule Air Base unveiled its new state-of-the-art structure—a single-story, 1,900-square-meter medical center. The medical center was built by a Denmark-based firm under a design/build contract and supervised and quality assured by the USACE New York District. The previous medical center, which was built 50 years ago, was becoming too expensive to operate and was located far from the current housing facilities of the main base population. Besides saving the U.S. Air Force money on costly utility services, the base personnel—as well as residents of local West Greenland communities—benefit from the services of the new facility. Some of the new services the medical center provides are outpatient and inpatient care, surgical services, and mortuary facilities. An additional service is digital X-rays that supply a



Thule Air Base, Greenland, the northernmost U.S. military installation.

quicker product to doctors and have lower radiation dosages and no adverse effects on the environment.

Overseas projects, like the new medical center at Thule Air Base, can prove to be very challenging, but also rewarding. For USACE personnel, working on overseas projects allows them to experience different cultures, visit various parts of the world and, most importantly, broaden their construction skills and experiences. The construction of the new medical center was a project that did just that.

The severe weather at Thule Air Base can create a lot of logistical challenges and result in construction that is very



The new medical center at Thule Air Base

unique and fast-paced. There is a limited exterior construction season because Thule is above the Arctic Circle. There are 24 hours of sunlight from June to August and 24 hours of darkness from November to February. During the summer season, high temperatures are in the mid-50s. It was during these warmer months that the USACE team was able to receive its construction materials because the island is locked in by ice the other 9 months of the year. But in the summer, Greenland's frozen shipping lanes can be broken up to allow supply ships in. During the winter, the weather is too severe to work outdoors, so construction of the medical center took place during the summer and fall months between May 2003 and October 2004.

Due to the harsh arctic environment, the medical center had to be constructed differently than a typical building. Two-thirds of the northern portion of Greenland, where Thule Air Base is located, is covered by 6 to 12 feet of permafrost—permanently frozen ground at variable depths below the earth's

surface. Most structures in Thule, including the medical center, are elevated because of the presence of permafrost. Buildings must be constructed off the ground or have air corridors separating the buildings from the ground, because the heat from inside the buildings can melt the permafrost, causing the buildings to sink. Materials used to build the new elevated facility included preinsulated metal panels for the underside of the flooring, walls, and roof; composite gypsum; and a metal decking system for the interior floors.

Construction on the medical center was performed in collaboration with teams from various agencies, to include engineers from both the USACE New York and Europe Districts. The on-site manager for the new medical center, who was from the USACE New York District, was familiar with the working conditions at Thule Air Base, because he has worked on various construction projects at the base, both as a military officer and civilian employee, for the last 20 years. Because of the strong working relationship between all the agencies, they were able to resolve issues that arose due to the many challenges Thule's limited logistics, severe weather, unique construction activities, and short construction season brought to the project. The collaboration between the agencies produced a great finished product that both Thule Air Base and the engineers involved are proud of. Completing a project under severe climatic conditions in such a remote area of the world is a dream come true.

For additional information about Thule Air Base, visit its Web site at <www.thule.af.mil>; for information on the USACE military construction program, contact the author at <joanne.castagna@usace.army.mil>.



Dr. Castagna is a technical writer with the U.S. Army Corps of Engineers, New York District.



Preparing and insulating the medical center's foundation



BRIDGING THE GAP IN HOMELAND SECURITY: 62D ENGINEER BATTALION HELPS SECURE THE NATION'S BORDERS

By Lieutenant Colonel Alfonso Riera and Captain Richard T. Childers

The terrorist attacks of 11 September 2001 pushed the patrol of U.S. borders to the front line of national security. And today, security efforts along the southwest and northern borders continue to expand. The U.S. Border Patrol's heightened presence along the southwest border has burdened narcotic traffickers, alien smugglers, and other transnational threats to our country. In fiscal year 2004, border patrol agents seized more than 20,000 pounds of cocaine and more than 1.5 million pounds of marijuana—a street value of more than \$1.9 billion.

Request for Assistance

In late summer of 2003, the U.S. Border Patrol, Del Rio (Texas) Sector Headquarters, requested assistance from Joint Task Force-North (formerly known as Joint Task

Force-Six) to have a military engineer unit construct a bridge over Cuevas Creek on the U.S.-Mexican border near El Indio, Texas. The bridge would reduce the response time between two border patrol stations, increasing the capability to apprehend illegal immigrants of many nationalities and to interdict drug traffic.

The U.S. Border Patrol frequently requests military support from Joint Task Force-North, which detects, monitors, and supports the interdiction of suspected transnational threats within and along the approaches to the continental United States. The task force fuses and disseminates intelligence, contributes to the common operating picture, coordinates support to lead federal agencies, and supports security cooperation initiatives to secure the homeland and enhance regional security.

The 62d Engineer Battalion (Combat) (Heavy) accepted the construction challenge and assigned the mission to its heavy-construction company (Alpha Company). The battalion, a III Corps Army engineer asset, is one of few active-duty heavy-construction battalions; therefore, it is a highly sought-after resource.

Mission

In addition to erecting a three-span, nonstandard fixed Bailey bridge, the construction mission would include upgrading two access roads, operating a quarry pit, performing excavation and filling operations, complying with environmental requirements, placing hundreds of cubic yards of concrete, and constructing approach roads.

Project Planning

The project was a joint venture between the U.S. Army Corps of Engineers® (USACE) Fort Worth District, Joint Task Force-North, and the U.S. Border Patrol. USACE contracted a project management firm to coordinate the efforts of the project delivery team. Alpha Company developed the construction schedule, bill of materials (BOM), and equipment requirements. Due to logistics and time constraints, much of the required equipment was contracted from rental vendors. Construction materials were procured through USACE, using U.S. Border Patrol funding programmed specifically for border infrastructure.

Force Providers

On 14 July 2004, Joint Task Force-North and unit leaders coordinated the arrival of the advance party at the site, as well as all of the earthmoving equipment (both organic and rental). These force providers—made up of U.S. Army Reserve Soldiers from New York, Pennsylvania, Texas, and Minnesota—set up

the base camp and prepared the ground work for the main body of Soldiers, cycling personnel on their annual training periods throughout the duration of the project. The Soldiers hit the ground running and organized into construction groups based on specific tasks. They erected and maintained all tents, shower and laundry facilities, and power and water systems. While the force providers maintained the camp and quality of life, the 62d Engineer Battalion concentrated on the construction mission.

Earthwork

The banks of Cuevas Creek were extremely steep, unstable, and covered in dense vegetation due to the unseasonable amount of rain the area had received during the 3-month project—more than is typically expected in a 5-year period. The earthmoving platoon created a borrow pit 6 miles away to provide material for the patrol road base and nonstructural areas of the project. Each pier and abutment location was overexcavated and built back with engineered fill, distributing the load of the shallow spread or “floating” footers. The engineered fill, which had to conform to Texas Department of Transportation standards, was delivered from a certified quarry. To minimize the excavation required along the banks, the Pro-Tec™ shoring system was used as an alternative to a standard trench box due to its ability to be advanced to greater depths and provide an open excavation, which was necessary to place the bridge piers.

Soldiers from the equipment platoon of the 62d's Headquarters and Support Company improved the existing trails on either side of the bridge into suitable all-weather patrol roads. More than 45,000 cubic yards of borrow pit, select fill, and native material was displaced and stockpiled during the initial earthwork phase. This material was used to restore the site's finished grade to its natural state at the end of the project.



Aerial view of scour apron preparation

Foundation System

The substructure design of the bridge was identical to a commercial-grade highway overpass—designed and built according to Texas Department of Transportation standards. The piers and abutments on either side of the gap were constructed roughly in the same phases. Accuracy was paramount during this period; any error made on the ground would be magnified as the structures went vertical. A maximum deviance was allowed (1/8-inch horizontal and 2-inch vertical) to ensure that the bridge would match the support points. The reinforced concrete substructure used more than 1,000 cubic yards of concrete and 22 tons of steel reinforcement.

The bridge abutments were built on a shallow spread foundation bearing on 4 feet of engineered fill, compacted to 100 percent maximum dry density according to worldwide

standards. Standing 15 feet tall, they were topped by a cap and corbel that allowed the finished bridge deck to sit even with a reinforced concrete approach slab. The abutments were finished by placing multitier wingwalls to confine the base of the approach road.

The two bridge piers also used shallow spread foundations resting on 5-foot subfooters of engineered backfill. The reinforcing steel for each pier stem was preassembled into six 7- by 30-foot rigid mats, which were placed using a 40-ton crane. The 33-foot piers had to be placed in four phases—footers, lower pier stem, upper pier stem, and pier cap—according to the limits of the Symons™ forms rented for the project.

Erosion Control

The project site was located in a flood plain at the lowest point in the watershed. The height of the bridge's superstructure was designed to be above the flood elevation level of the 50-year storm (equivalent to receiving 2.7 inches of rain in 3 hours). Erosion control was particularly important, especially with the shallow spread foundations of the piers and abutments. The risk, as with any bridge over a water feature, is that moving water will erode the engineered fill from under the piers or abutments, undermining the footings and causing the bridge to fail. To ensure that this would not occur, a 50- by 150-foot scour apron was constructed on either bank, 6 feet under the finished grade. The most important feature of this scour apron was the 6-foot cutoff walls that bordered the perimeter of the apron below the maximum calculated scour depth. To further protect the integrity of the finished slope, the unit anchored Pyramat® (a geosynthetic lining material) over the finished grade to prevent erosion while the slope becomes revegetated.

Bridge Launch

The bridge came directly from the company, with some tailor-made components to match the substructure. The rocking rollers on the abutment seats and the pier caps had to be raised on nearly 3 feet of cribbing to meet the elevation of the abutment corbel and approach slabs. Two John Deere™ 410 tractors were used to position the panel trusses during assembly; however, the tried and true "lay-hold-heave" method was used for all other components. Once the bridge had spanned the gap and was jacked down onto the bridge shoes, the company placed the stringers, decking, and curbs.

Lessons Learned

During this project many quality-control lessons were learned. Unlike most missions, many external civilian and military quality assurance/quality control (QA/QC) personnel were on hand to bridge the gap between the Soldiers' skill level going into the project and the civilian industry standard. When many parties are involved in oversight of a project, all QA/QC personnel have to agree on the standards before the work is completed. One way to ensure that this happens is to have Soldiers build a mock-up, or test section, before full-scale construction begins. This ensures that everyone knows exactly what is required and prevents undue frustration and needless work. Other considerations include the following:

- Keep a daily QA/QC log; use it to identify trends and stop potential problems.
- Get approved modifications *in writing*; keep them on hand.

On any project of this magnitude, proper BOM management is critical. Material should flow in and out of a centralized



An engineer flag flying high during the launch



Finished bridge launch

point where it is accounted for and protected from the elements. Important considerations include the following:

- Assign a BOM manager who is responsible for accepting, inventorying, and safeguarding materials.
- Develop a material-tracking matrix that incorporates fabrication and/or shipping lead times.
- Beware of the temptation to use the material for purposes other than what it is specified for.

Using prefabricated, hand-set panel forms has its pluses and minuses. On the plus side, their cost effectiveness, light weight, and strength allow large-scale projects to be constructed quickly using fewer man-hours than standard timber forms. Panel forms can be used as "slip" forms; the bottom sections can be stripped off, then reused to place sections above as soon as the concrete achieves a specified strength. The risk with using panel forms is that they will "float" up when concrete is being placed, primarily due to their light weight. A solid connection with the base or footer is critical. Other considerations include the following:

- Check all pinned panel connections before placement.
- Do not overvibrate concrete during placement.

Project Completion

Although project completion was originally planned for 2 months, heavy rains and technical problems added another month to the schedule. But the project provided a training and leadership opportunity that would be difficult to duplicate within the military training environment. The Soldiers were able to greatly increase their survey, design, and horizontal and vertical construction skills. The result is a

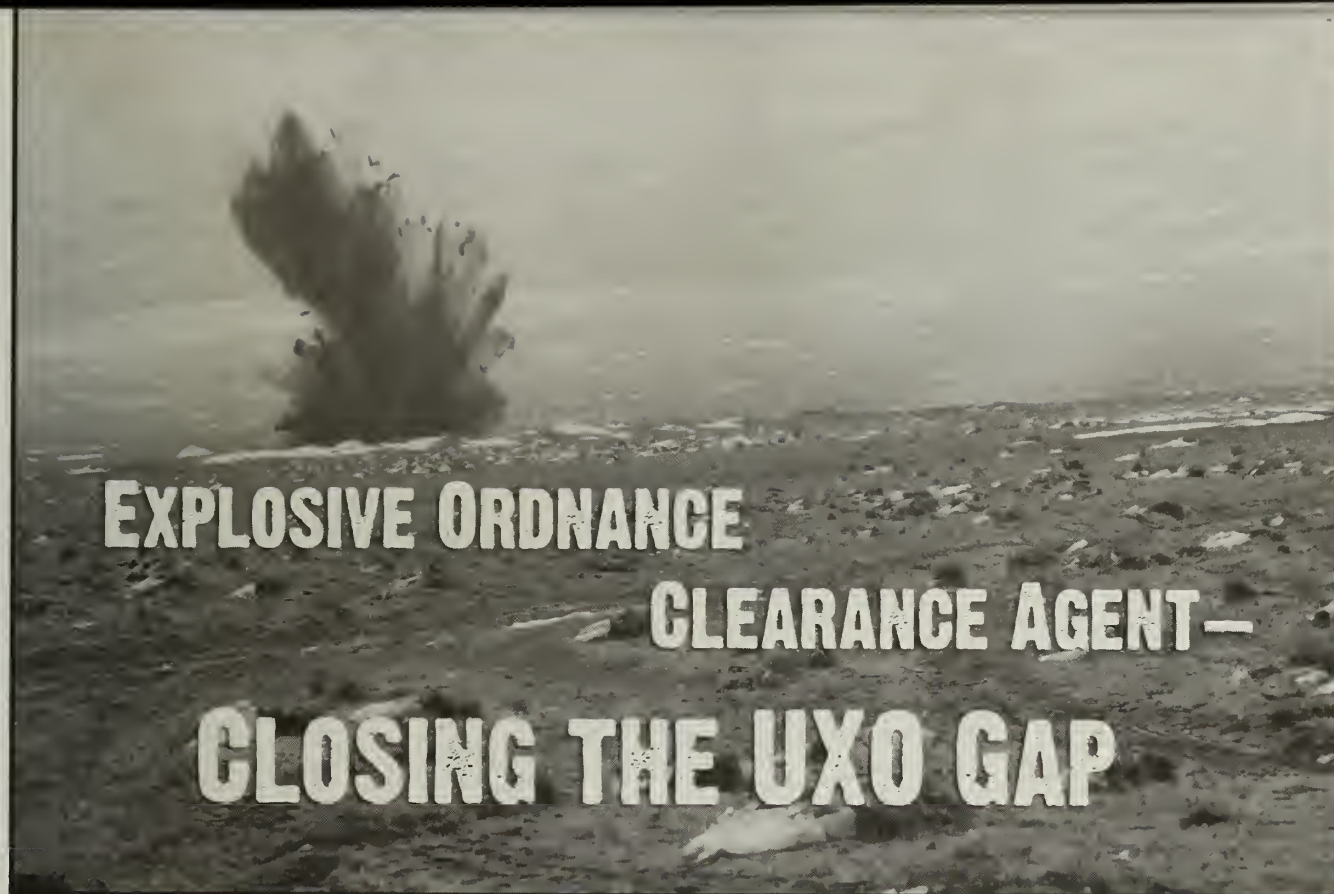
highly confident group of engineer Soldiers who will take these experiences and use them during future military missions.

The mission incorporated specialists from other military services and agencies to make it a true joint and interagency operation. Joint Task Force-North Marines provided logistical planning and construction support, while Army planners assisted with base camp setup and teardown.

A great partnership developed among Joint Task Force-North, the 62d Engineer Battalion, the U.S. Border Patrol, and the members of the project delivery team. The mission—a win-win situation for all involved—was a complete success. Thanks to the great efforts of our brave men and women in uniform and the professionals of our civilian workforce, one more gap at our nation's borders has been bridged. 

Lieutenant Colonel Riera is the Joint Task Force-North Engineer Division Chief in Fort Bliss, Texas. He served as the Texas-New Mexico engineer mission planner for the task force during construction of the bridge. He was previously the S3 of the 82d Engineer Battalion, 1st Infantry Division, Bamberg, Germany, and the Director of Public Works for the Mannheim military community, Germany. He is a graduate of the University of Toledo and Troy State University.

Captain Childers is the civil engineer for the 62d Engineer Battalion. He served as the construction officer, Alpha Company, 62d Engineer Battalion, during the construction of the bridge. Previous assignments include platoon leader, Bravo Company, 1st Battalion, 121st Infantry, Georgia Army National Guard, and assistant S3 of the 62d Engineer Battalion. He holds a bachelor's in environmental engineering from Mercer University.



By Command Sergeant Major David M. Clark

The Global War on Terrorism and the contemporary operating environment continue to demonstrate an increased need for the destruction of unexploded ordnance (UXO) on the battlefield. UXO is found throughout the operational area, often in theaters with poor infrastructure and severely restricted terrain, which limits movement. Moving explosive ordnance disposal (EOD) teams on the battlefield may require dedication from rotary-wing assets, because the lack of roads prevents rapid movement by ground. Also, maneuver commanders need an increased capability to destroy in-place UXO that endangers the mission or personnel.

EOCA Course Creation

To close the gap between EOD personnel and combat engineers, the EOD Integration Working Group, consisting of members from both the engineer and EOD communities, recommended the creation of an Explosive Ordnance Clearance Agent (EOCA) Course to train engineers and increase the force's ability to deal with UXO on the battlefield.

Explosive ordnance clearance is defined as the investigation, detection, location, marking, reporting, and preparation of protective works for UXO. It also includes the in-place disposal of UXO identified in the EOCA Identification Guide and theater-specific UXO handbook. EOCA training does not authorize or qualify engineers to clear or dispose of caches and captured enemy ammunition without EOD clearance and direction, nor does it qualify or authorize engineers to

deal with improvised explosive devices (IEDs). The role of EOCA-qualified engineers is to dispose of in-place, selected UXO that is positively identified in their EOCA handbook, while performing combat engineer missions. EOCA-trained personnel are not responders—this mission remains with EOD-qualified personnel.

EOCA Course Purpose

The purpose of the EOCA Course is to teach skill levels 10 and 20 (from promotable specialists to staff sergeants) combat engineers and selected engineer officers (from second lieutenants to captains) the basic skills and knowledge required to perform as EOCA's. The course is challenging and demanding because it requires students to learn and retain a vast amount of information in a short amount of time. Requirements for attendance at the EOCA resident course—now offered at Redstone Arsenal, Alabama—are a qualified combat engineer military occupational specialty; an Armed Services Vocational Aptitude Battery (ASVAB) test score of 105 or above; a grade of specialist (promotable) or sergeant, or company grade officer; an interim secret or secret security clearance; and normal color vision. The intent of the course is to train two EOCA's per combat engineer squad, preferably one being a squad leader, team leader, or specialist (promotable) from the same squad with 1 year of retainability. A minimum of one qualified engineer officer in the company should be trained as well.

Upon approval by the Department of the Army and the Army Training Requirements and Resourcing System (ATRRS), EOCA graduates receive training qualification and an additional skill identifier. The EOCA certification will be valid for one year from graduation, and graduates will be required to be recertified by qualified EOD and EOCA instructors. The Army Safety Policy for Captured Enemy Ammunition, approved by the Office of the Assistant Secretary of the Army, Installations and Environment (28 June 2004), should be updated to include EOCA capabilities and authority to deal with selected UXO. Check your local command policy to determine the authorized level for dealing with UXO by EOCA-qualified engineers in the combat zone or area of operations.

EOCA Course Description

Working with the United States Army Engineer School; the Ordnance Munitions and Electronics Maintenance School; the Explosive Ordnance Disposal Training Department at Redstone Arsenal; and the Combined Forces Land Component Command (CFLCC) Engineer Section (C7), the Combined Joint Task Force (CJTF)-76 requested and received approval to conduct the pilot EOCA Course in Afghanistan. The CJTF-76 engineer staff (CJ7) identified combat engineers throughout the combined and joint operational area to attend the first two EOCA Courses. This training enabled Soldiers in theater to share their experience with the instructors about UXO they encountered on patrols,

route and area clearance operations, and other combat missions throughout Afghanistan. The first course was conducted from 29 December 2004 to 1 February 2005, and graduates included engineers from the Active Army and Reserve Component and the U.S. Marine Corps. A second course was conducted in March 2005 with more engineers completing the rigorous course. The courses consisted of four phases:

Phase 1, Annex A. The first phase included an EOCA ammunition terminology examination (a closed-book examination concerning EOCA general safety precautions with UXO), a block of instruction on safety, ordnance color codes and markings, explosives and explosive effects, and basic demolition procedures. The ordnance color codes and markings block of instruction covered how to properly identify ordnance, type, filler, and markings of both U.S. and foreign ordnance, using information learned from the color code/markings charts. The block on explosives and explosive effects covered the characteristics, properties, and explosive effects and principles, including basic explosive firing training, properties, and components. There was also an examination on basic demolition procedures in which students had to properly identify explosive electric, nonelectric, and modernized demolition initiator firing systems; demolition equipment; and procedures for preparing a demolition firing system, to include various firing system components, equipment, and setups. The end-of-block examination for Annex A was a closed-book,



EOCA students going over protective measures



Instructors with students of the EOCA course at the range

comprehensive written examination encompassing all subject matter learned in this annex.

Phase 2, Annex B. This phase was known as the Identification of Munitions (Ordnance Identification). This block of instruction covered thrown, projected, dropped, and placed ordnance. Students also learned about protective measures after identifying the different types of munitions. After receiving the EOCA Identification Guide, the students were engaged in daily practical exercises (eight ordnance items per day) to reinforce the contents of the guide.

Phase 3, Annex C. This phase was a hands-on, performance-based test that required students to conduct EOCA reconnaissance of UXO in a safe and proper manner. There was also a block of instruction where the students determined disposition of ordnance items while conducting EOCA operations. Positive identification of ordnance items and EOCA reporting was also reinforced during this lesson.

Phase 4, Annex D. The last phase of the course encompassed a combined practical exercise on the demolitions range, destroying live enemy munitions in theater.

EOCA Course Results

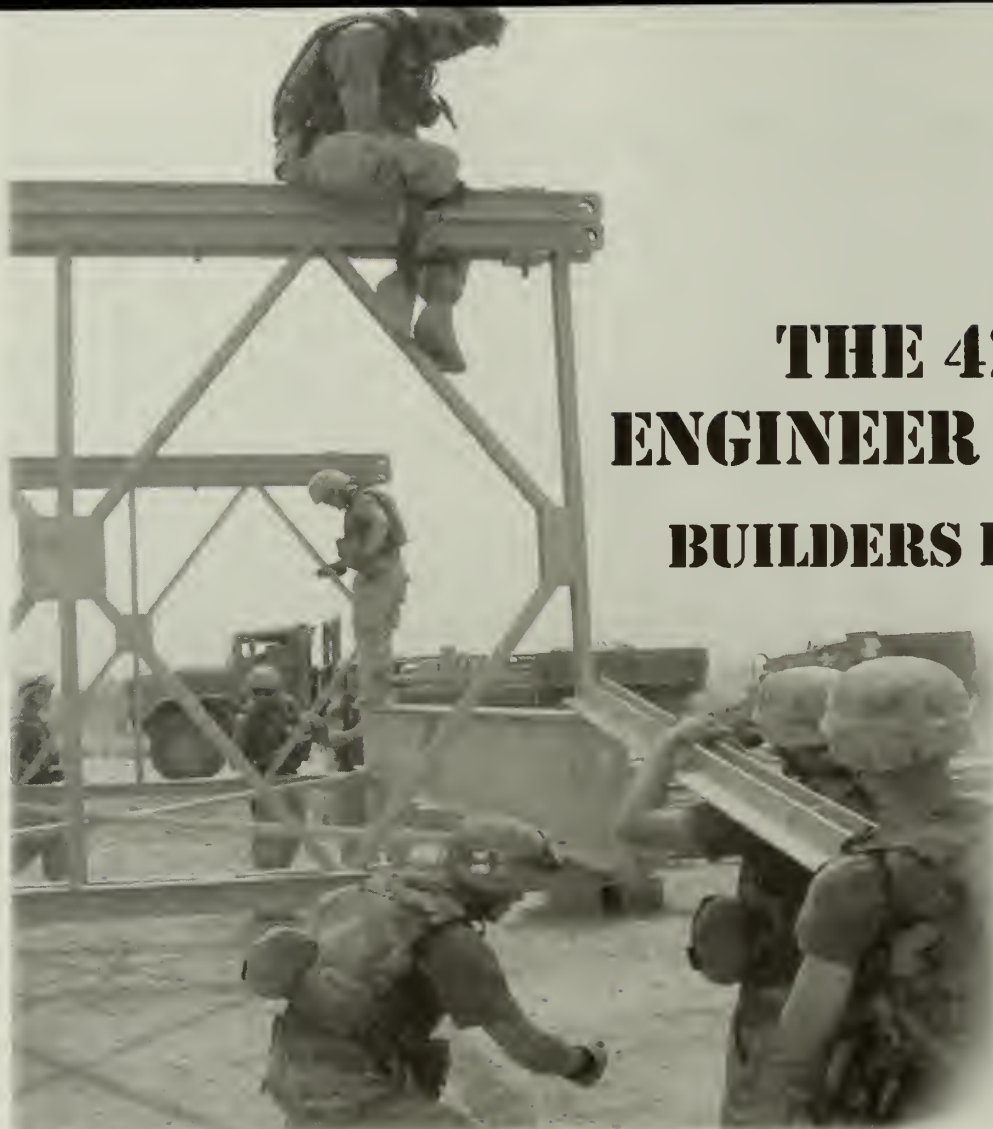
General feedback from the students was very positive. When the course began, nearly all the students rated their training level on UXO a low 1 out of a possible 5,

but after the training the rating improved to a 5. Many combat engineers recommended the addition of more threat mine information to the EOCA handbook and that the Engineer School consider adding more threat mine training or familiarization to Advanced Individual Training (AIT) and Basic Noncommissioned Officer Courses (BNCOC).

The EOCA Course definitely increased the proficiency of our combat engineers on explosives and increased their capabilities in dealing with selected UXO in a tactical environment. Based on the training received, these engineers are now a more effective combat multiplier and viable force protection asset available to their commanders. They have an enhanced ability to positively identify UXO, recommend protective measures to on-site commanders, report more accurately, and construct protective works if necessary. The training completed by these engineers will enable them to perform safer and more effective route and area clearance operations.



Command Sergeant Major Clark is the command sergeant major of the 65th Engineer Battalion, 25th Infantry Division (Light), Schofield Barracks, Hawaii. He is a Sapper Leader Course graduate and has served in both Operation Enduring Freedom and Operation Iraqi Freedom.



THE 420TH ENGINEER BRIGADE: BUILDERS IN BATTLE

By Major Keith A. Dotts

In early December 2003, the 420th Engineer Brigade was alerted and mobilized for deployment in support of Operation Iraqi Freedom. Before deploying, the unit spent a month at Fort Hood, Texas, conducting leadership validation and mobilization training. On 6 January 2004, the brigade's advance party deployed to Kuwait and then moved to Logistics Support Area (LSA) Anaconda to begin the transfer of authority from the 130th Engineer Brigade. The main body of the Headquarters and Headquarters Company (HHC) of the 420th and the rest of the staff deployed on 8 January. Once in Kuwait, they began conducting theater training, establishing equipment requirements, and preparing personnel for movement into Iraq.

The mission of the 420th was to provide command and control of theater engineer forces, under the Multinational Corps-Iraq (MNC-I), in support of postconflict reconstruction. This was a twofold mission requirement because its corps staff engineer section worked as the III Corps MNC-I staff engineer section (C7), and the 420th was the Iraqi Theater Engineer Brigade (TEB). In short, the C7 team focused on MNC-I mission requirements, and the 420th was responsible for the operational control of all assigned engineer units while deployed in Iraq. The 420th was represented on the battlefield

by many types of engineer units: mechanized; combat heavy construction; corps wheeled; topographic; multirole bridge; construction support equipment (CSE), asphalt, paving, and rock crushing; as well as facility engineer teams (FETs); U.S. Army Corps of Engineers® teams; and design and management teams. The brigade engineer units also included U.S. Marine bridge companies, prime power detachments, firefighting teams, well-drilling detachments, and several other separate engineer companies.

The completion of the transfer of authority from the 130th to the 420th signified the beginning of the efforts and engineer support that led to the accomplishment of all missions in Iraq. The main staff stayed at LSA Anaconda and kept the theater operations moving forward, while HHC, the 420th, and the C7 team set up a home at Camp Victory. Over the next 30 days, the brigade conducted concurrent combat operations from LSA Anaconda and Camp Victory, but it was evident that the entire brigade needed to be stationed at Camp Victory. So the brigade moved to Camp Victory, where the 420th established the command and control requirements of theater engineer forces and conducted all TEB combat operations.

While supporting Operation Iraqi Freedom, the 420th was responsible for many significant missions:



Soldiers from the 285th Engineer Company (CSE) construct a forward operating base.

- Completion of the unpaved section of Highway 1
- Emplacement of 12 military-type bridge structures
- Emplacement of wells
- Construction of force protection facilities
- Construction of enduring base camp facilities
- Construction of schools, clinics, airfields, and roadways
- Support to the captured enemy ammunition (CEA) missions that destroyed more than 6,000 tons of enemy caches of explosives and weapons
- Support to combat operations in Fallujah
- Conduct of combat convoy operations
- Conduct of dive team recovery operations
- Completion of domestic action projects
- Training on Interim Vehicle-Mounted Mine Detection (IVMMD) Systems
- Training of the Iraqi Civil Defense Corps (now the Iraqi National Guard)
- Conduct of Task Force Right-of-Way
- Conduct of Task Force Pathfinder
- Support to Jordan's Task Force Haul
- Development and maintainance responsibility for reception, staging, onward movement, and integration (RSOI) of engineer units



The 420th Engineer Brigade destroys enemy ammunition.

The 420th Engineer Brigade redeployed in December 2004 and, after completing its demobilization requirements on 22 December, was released from active duty. No matter what the mission, the 420th is always ready and willing to complete all assigned combat operations. The brigade truly epitomizes the engineer motto of *Essayons*, "Let us try."



Major Dotts is the Active Army S3 Chief of Operations of the 420th Engineer Brigade, III Corps. He served as the C7 Operations Officer for Combined Joint Task Force-180 in Afghanistan in support of Operation Enduring Freedom and then deployed with the 420th Engineer Brigade as the S3 Chief of Operations in support of Operation Iraqi Freedom. Other assignments include command of Bravo Company, 841st Engineer Battalion (Corps) (Wheeled). He holds a bachelor's in history and is working on a master's in strategic leadership from Mountain State University.

The Army's New Protective Eyewear

By Mr. Larry T. Hasty

During the past few years, the U.S. Army has adopted several new types of commercial protective eyewear to help minimize the number of eye injuries during combat missions and training. Until recently, the choices were limited to the old sun, wind, and dust goggles (SWDG); the ballistic laser protective spectacles (BLPS); and the special protective eyewear, cylindrical system (SPECS). The new types of eyewear are commercial, off-the-shelf items that have passed the U.S. Army's testing criteria and are currently being issued to deploying Soldiers through the Army's rapid-fielding initiative. Units can order the authorized commercial eyewear using the national stock number. Funded military standard requisitioning and issue procedure (MILSTRIP) requisitions need to be submitted through normal supply channels to the Defense Supply Center, Philadelphia, General and Industrial.

The new eyewear is categorized as either spectacles or goggles, according to the test criteria each must pass to be authorized for use by Soldiers:

- **Spectacles** are required to stop a 5.8-grain fragment simulating projectile moving at a speed of 640 feet per second.
- **Goggles** are required to stop a 17-grain fragment simulating projectile moving at a speed of 550 feet per second (approximately twice the energy impact of spectacles).

Although some of the approved spectacles may meet the testing requirements of goggles, combat-vehicle crewmen should choose from the list of approved goggles in order to receive the appropriate level of fragmentation protection, as well as added sun, wind, and dust protection.

Although these new commercial items provide excellent ballistic protection, none of them protect the eyes from lasers. If an operation or a training mission requires laser eye protection, the SWDG, BLPS, or SPECS with laser lens must be worn. For Soldiers who require prescription lenses, the Uvex XC™ spectacle with prescription lens carrier (PLC), the eye safety system (ESS) Interchangeable Component Eyeshield (ICE) 2™ spectacle with PLC, and the Revision II Sawfly™ with PLC are authorized alternatives to the BLPS.

An updated authorized protective eyewear list, published by the Program Manager-Clothing and Individual Equipment (PM-CIE), provides information for ordering the new eyewear. The list can be found on the Program Executive Office Soldier Web site at <http://www.peosoldier.army.mil/index.php?section=product>. The list can be accessed by opening the "Commercial Eyewear Fact Sheet" link located on the right-hand side of the page, directly below the graphic of the new "Army Combat Uniform."

Following is a detailed description of the authorized commercial goggle kits. All of the goggles are one size fits all, and all the kits include two ballistic protective lenses, one clear and one tinted. These lenses are made with antiscratch and antifogging coatings and provide protection from ultraviolet rays. Each kit has an antireflective sleeve that reduces glint when the goggles are not in use.

- **ESS Land Ops™** goggles can be worn by Soldiers who wear prescription lenses and those who do not. These goggles fit over the standard Army-issued eyeglasses. The kit includes a rubber frame with a foam backing that wicks away moisture and increases comfort for long periods of use. Foam-covered holes allow ventilation and help eliminate fogging, while keeping out dust.



ESS Land Ops Goggles

- **ESS Profile NVG™** (night vision goggles) are strictly for Soldiers who do not require prescription lenses. These goggles fit closer to the face (because of their rubber backing) and are more compatible with night vision goggles. A thin fleece backing, which may improve comfort when wearing the goggles in very cold weather, is being evaluated at Fort Knox, Kentucky. Outrigger clips on the strap allow optimal helmet compatibility without breaking the face seal. Like the ESS land operations goggles, foam-covered holes in the frame allow ventilation, while keeping out dust. The kit can be ordered in one of three frame colors—black, olive drab, or desert tan.



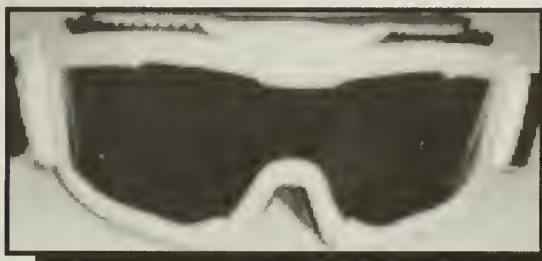
ESS Profile NVG

- **ESS Vehicle Ops™** goggles are used for vehicle operations involving excessive dust. The high-density, restricted-perimeter filtration provides protection against airborne debris while traveling at high speeds. These goggles fit over most eyeglasses, and the frame has a foam backing that wicks away moisture.



ESS Vehicle Ops Goggles

- **Arena Flakjak™** goggles are designed for Soldiers who do not wear eyeglasses. These goggles consist of a molded frame with a ventilation screen, which allows air to flow through to minimize lens fogging. The frame has a foam backing that fits to the face and wicks away moisture.



Arena Flakjak Goggles

Soldiers in combat and training run a high risk of losing their eyesight. Sixteen percent of the casualties of the coalition forces are attributed to eye injuries. Several reports from these Soldiers indicate that the Army's new protective eyewear has protected their eyes from shrapnel numerous times. Although flying shrapnel from an enemy weapon blast is the most dangerous threat to a Soldier's eyes, many other hazards—such as flying sand, dust and debris from helicopters, high winds or overpressure, flash fires, and lasers—threaten eye safety as well. The new types of commercial protective eyewear are the ideal solution for minimizing those hazards.

For additional information about any of the protective eyewear, contact Mr. Larry T. Hasty at DSN 464-3662, commercial (502) 624-3662, or e-mail <larry.hasty@knox.army.mil>; Mr. Myron Pross, PM-CIE, at DSN 444-2510, commercial (215) 737-2510, or e-mail <MyronPross@dla.mil>; or Mr. Frank Cole at DSN 645-9907, commercial (256) 955-9907, or e-mail <frank.cole@logsa.redstone.army.mil>.



Mr. Hasty is the Soldier Project Officer assigned to the Science and Technology Division of the Unit of Action Maneuver Battle Lab at the U.S. Army Armor Center, Fort Knox, Kentucky.



THE 44TH ENGINEER BATTALION DEPLOYS AGAIN

By Second Lieutenant Patrick J. Anderson and Second Lieutenant Jennifer Sanford-Hayes

The 44th Engineer Battalion deployed from Korea in August 2004 to serve in Iraq under the 2d Brigade Combat Team, 2d Infantry Division. The deployment of the 44th marked the first time that any unit serving in a deployed environment was re-deployed to another theater of operation. This deployment set historic precedents not experienced by any other Army unit during the Global War on Terrorism—or any other conflict.

The 44th Engineer Battalion—also known as the “Broken Heart” Battalion—deployed to Korea from Fort Bragg, North Carolina, and landed with the historic invasion force at Inchon, in September 1950. The 44th served on the Korean Peninsula for more than 50 years, making it the longest continuously serving battalion in Korea. With the battalion’s departure, it has left behind a great legacy that will be remembered for years to come.

The Soldiers of the 44th and the rest of the 2d Brigade Combat Team prepared for departure with only a few months notice—a monumental achievement. Getting the Soldiers ready for Operation Iraqi Freedom required not only the efforts of the leaders and the troops deploying but also the support and tireless efforts of those staying behind.

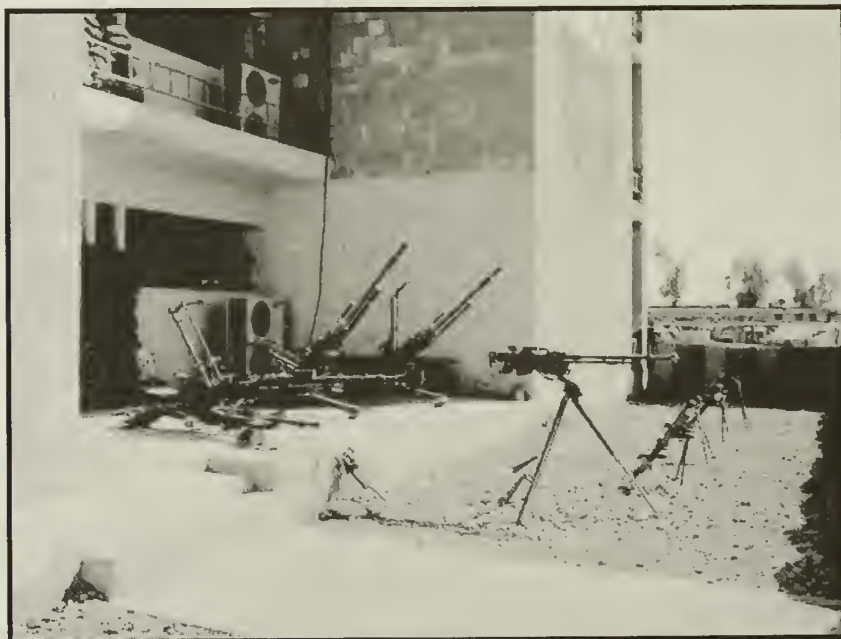
In an effort to recreate the conditions the troops would face in Iraq, the 2d Infantry Division set up contemporary operational environments throughout the western corridor of Korea. The Korean Training Center was the site of a mass conglomeration of units, including infantry, artillery, aviation, and engineers. Contractors posing as Iraqi civilians moved all through the camp, testing the defenses and readiness of forward operating bases (FOBs). A military operations on urbanized terrain (MOUT) village was constructed with the help of the Korean Service Corps to augment the

already formidable MOUT training site on the Korean Training Center.

Soldiers getting ready to deploy to Iraq were sent through as much realistic training as possible. They had to react to ambushes; identify and clear improvised explosive devices (IEDs), mines, and booby traps; and conduct MOUT training. Patrolling and handling crowds of inquisitive civilians—any of which could be potential enemies—were heavily emphasized.

Once the 44th Engineer Battalion set foot on the ground in the Middle East, its immediate priority became terrain familiarization and acclimatization at Camp Buehring, Kuwait. Major tasks it performed included receiving its vehicles and equipment, as well as new equipment that would allow it to operate in the harsh desert environment. The main focus in Kuwait was combat preparations. There were numerous live-fire exercises, combat loading of all equipment, and rehearsals for the tactical movement into Iraq. Upon completion of these preparations, the 44th conducted a tactical convoy to its FOB in Ar Ramadi, the provincial capital of Al Anbar Province, located west of Fallujah and Baghdad along the Euphrates River.

Army engineers were engaged in a variety of diverse missions during the course of the Global War on Terrorism that encompassed the full spectrum of military engineering. The 44th was also prepared for a variety of missions. These missions included managing, maintaining, and repairing all facilities for two FOBs; performing enemy cache searches throughout the brigade area of operations; performing route clearance missions and IED searches and neutralization; building barriers to protect local government facilities;



Iraqi weapons in front of the battalion headquarters

supporting infantry task forces with engineer support and demolition missions; and performing traditional infantry-type tasks.

As the days became weeks, the 44th developed a better understanding of what their time in Iraq would be like. In September 2004, the 2d Brigade Combat Team of the 2d Infantry Division was given responsibility for Ar Ramadi and the surrounding areas. The 44th contributed significantly to providing a safe and secure environment for the freedom-seeking Iraqi people.

An unexpected task was preparing the Ar Ramadi area for the Iraqi elections held in January 2005. The successful implementation of the democratic process in Iraq stands as a testament to the Soldiers of the 44th. Their efforts in Ar Ramadi helped ensure that the citizens of Iraq were afforded the opportunity to vote. The Soldiers put in long, stressful days constructing fortifications around polling centers, as well as providing security on the day of the elections. Thanks in part to their tireless efforts, no Ar Ramadi citizens were injured by enemy activity while casting their ballot on election day. The Soldiers of the 44th also trained members of the new Iraqi security forces to support the elected government of Iraq and assume responsibility for ensuring a safe and secure environment for the citizens of Iraq. This historic work was critical to our nation's efforts in the Global War on Terrorism.



Detonation of an IED discovered by members of the 44th Engineer Battalion

The missions of the 44th Engineer Battalion gave its Soldiers an opportunity to work with a variety of other military organizations. Members of the Iraqi security forces served beside the Broken Heart Soldiers during the elections. These Iraqi soldiers were integral in providing security to the Iraqi people and demonstrating to them that they are on their way to self-reliance. Members of Bravo Company, 44th Engineer Battalion were also able to work beside engineers from the U.S. Marine Corps, who fought right by their side on many missions.

The mission of the 44th Engineer Battalion continues. Recently, the Soldiers received news of their reassignment. Instead of returning to Korea, the 44th will be reassigned to Fort Carson, Colorado. This will mark the first time the 44th has returned to the United

States since it departed from Fort Bragg in 1948.



Second Lieutenant Anderson is the construction officer of the 2d Infantry Division Engineer Brigade. He received his commission into the U.S. Army in May 2003. He holds a bachelor's in history from the University of Delaware.

Second Lieutenant Sanford-Hayes is the chemical officer of the 2d Infantry Division Engineer Brigade. She entered the Army Officer Candidate School after college. She holds a bachelor's in agricultural science from California Polytechnic State University.

This article is dedicated to seven Soldiers from the 44th Engineer Battalion who lost their lives while defending freedom from the threat of terrorism. They are Private First Class Mark A. Barbret, Private First Class Aaron J. Rusin, Private First Class Andrew M. Ward, Specialist Robert O. Unruh, Sergeant Bennie J. Washington, Staff Sergeant Omer T. Hawkins, and Staff Sergeant Arthur C. Williams.



Soldiers receiving a convoy brief before departing Camp Buehring, Kuwait



Strengthening Army Leadership Courses by Training Adaptability

By Members of the First Engineer Command and Staff Course¹

Recently, Dr. Leonard Wong published a monograph examining the adaptability of deployed junior officers. "Developing Adaptive Leaders: The Crucible Experience of Operation Iraqi Freedom" provides an insightful look into the minds of today's young leaders. In his monograph, Dr. Wong challenges the Army to "acknowledge and encourage this newly developed adaptability in our junior officers or risk stifling the innovation critically needed in the Army's future leaders."² His work is significant because it confronts the Army's senior leadership with a problem that may greatly affect the force during future deployments. This article uses the framework from Dr. Wong's monograph to provide recommendations for improvement to officer leadership courses. In order to prepare future leaders for the conventional battlefield, leadership courses should train on nontraditional leadership roles (for example, civil affairs, project management, and fund management), provide a compilation of after-action reviews (AARs) and lessons learned from deployments, and establish a more in-depth mentor program.

Dealing With Complexity

Analysis

Structured training does not foster adaptive leadership. Current missions in Operations Enduring Freedom and Iraqi Freedom, in many cases, are not mission-essential tasks. Over the last few years, junior officers have grown accustomed to executing missions with only a task and purpose. This change in mission structure has created a new breed of creative, adaptable leaders.

Company grade officers will serve as a catalyst for change because of the full spectrum of operations encountered in Operations Enduring Freedom and Iraqi Freedom. It is critical that senior leaders recognize the method by which their junior officers accomplished real-world missions. Further, it is essential for senior leaders to support the ideas of their junior officers in the garrison and training environment.

Dr. Wong describes four major areas that necessitate adaptable leaders:

- **Complex Roles.** Deployed company grade officers operate in a dynamic environment. As well, they have additional duties in which they have little formal training. In the span of a day, these officers are required to be leaders, warriors, peacekeepers, and nation builders.

- **Cultural Complexity.** Deployed company grade officers become increasingly aware of the cultural impacts on their mission. Neglecting to train Soldiers on the effects of culture can have large-scale implications for today's military.
- **Complex Warfare.** Today's battlefield presents complex situations. Junior officers have to balance between restrictive rules of engagement (ROE), civilians on the battlefield, and a need to accomplish the mission.
- **Complexity Through Change.** Contemporary enemy forces are adaptive and innovative. They seek to create instability and havoc at the tactical level. To maintain situational control and gain tactical surprise, coalition forces engage in high-payoff, short-notice missions.

Recommendations

Complex Roles. The overarching situation is how to produce adaptive leaders in the Army. The first step starts in the U.S. Army Engineer School by teaching our junior leaders roles other than traditional engineer leadership (for example, squad leaders, platoon leaders, and company commanders). For the second step, we must understand that regardless of our military occupational specialty (MOS), we are Soldiers first. The third step is to allow all Soldiers involvement in and access to AARs.

- The most notable areas currently neglected by the Army's Junior Officer Development Program relate to civil affairs operations and funds management (outside of the company's budget). Civil affairs serves a wide spectrum of operations, which many junior leaders face daily during a deployment. Likewise, funds management deals with pay agent issues such as workforce management of local nationals. Junior leaders must have, at a minimum, baseline information (involving money from higher echelons) to allow adaptation to any situation.

As leaders, our experiences are valuable to junior leaders. We should share these experiences with future leaders. Near- and long-term solutions are mentoring programs, small-group meetings, and training exercises without troops (TEWTs). In addition, captains in the Engineer Command and Staff Course (ECSC) can write professional papers on lessons learned during deployment or in garrison, with the opportunity for publishing.³

- In the second step, Soldiers must understand that they are Soldiers first, regardless of the MOS. While deployed, the



Speedway forward arming and refueling point

operating environment is dynamic; one minute you may be handing out pencils to school children and the next minute be caught in a firefight. Company-level training must reflect this element and be supported two levels higher, unlike the traditional “trickle-down” training driven by higher echelons. The training must excite Soldiers. Soldiers are not set up for success when every field exercise is identical. During a deployment, Soldiers are functioning outside the job description of their MOS. Junior leaders must be prepared for this and should implement the diversions and real-world application into training.

- The third way to get all Soldiers involved is by allowing participation in and examination of AARs. When higher echelons withhold lessons learned, company grade leaders are forced to “reinvent the wheel” by designing tactics, techniques, and procedures that already exist. Leaders of all levels need access to AARs, which—by definition—are for future training through implementation of specific problem-solving methods.

Junior leaders need flexibility. Given the tools, they should be allowed to “wander off of the reservation” during training. They must train in garrison without excessive influence from higher headquarters, which prepares them for the real-world theater of operations.

Cultural Complexity. When deploying outside of the United States, almost every facet of life is drastically different from life in America. Many U.S. Soldiers have never been

outside of the country, let alone had to deal with people who are often scared of or hate Americans. Junior leaders must set the example for how to act toward local nationals. Consequently, cultural training for junior leaders is crucial to the success of a deployment.

It is unrealistic to expect that training will completely prepare a Soldier for a deployment. However, it is important for junior leaders to have training to “know what they don’t know.” A possible fix is for Soldiers who have deployed to the theater of operations—within the recent past—to brief units preparing to deploy. In addition, the Soldiers could include simple issues such as eating, greeting, working with men/women, and controlling crowds.

An immediate addition to ECSC should be a class during the leadership foundations module to discuss cultural awareness. It is likely our generation of officers will continue to face conflicts at the company level in the Middle East. There is sufficient experience to teach such a class among students who have recently deployed. A possible long-term solution is for students to compile cultural lessons learned, complete with scenarios. These scenarios will challenge junior officers during the tactics phase of ECSC. They will force captains to learn how to apply doctrinal thinking while thinking creatively, based on a region’s customs and courtesies.

Complex Warfare. ROE take on many forms and vary from mission to mission. The problem for leaders becomes how to enforce and abide by the ROE. The critical component of establishing and enforcing the ROE is communicating a higher

echelon's intent. Too often on the nonlinear battlefield, the situation changes quickly from nation building to tactical engagement and back again. The Soldier must quickly determine who is the enemy. Improperly crossing this delicate line will disrupt months of work and effort spent on fostering a positive relationship with the local nationals. It is essential for leaders to war-game scenarios, which provides guidance on potential situations.

The immediate and near-term action at the U.S. Army Engineer School should be to place a greater importance on discussing the ROE while conducting the military decision-making process (MDMP). Although time is limited in the training environment, any increase in incorporating the ROE into the scenarios will help leaders. The long-term solution involves collecting and compiling lessons learned from the AARs of Operations Enduring Freedom and Iraqi Freedom. A collection of real situations, the actions taken, and the lessons learned from those actions would be a valuable tool that company grade officers could take away. It would facilitate in-depth discussions and provide leaders with a practical training tool for various ROE scenarios.

Complexity Through Change. A near- and long-term response to this issue could be the implementation of a leadership mentor program for ECSC. Throughout each module, (common core, leadership fundamentals, tactics, and construction) captains need direct input to the MDMP—formal and informal, mundane and exciting. The end state is for field grade officers (focusing on the battalion commander) to take a team under their “mentorship wing.” Mentors could focus discussions on tactical and garrison topics and provide vital input on what they think is important for success as a company commander and as a future leader in today's (and tomorrow's) Army.

During the common-core module, mentors could come in—at least once—and meet with smaller groups (divide the class in half or thirds) in a seminar format. The mentors could lead the discussion, focusing strictly on topics of recent discussion in class. This would require that the small-group leaders send read-ahead packets to the mentors, ensuring that both the captains and the mentors were discussing the same topics.

The leadership fundamentals module mimics the previous process. However, the focus would shift to garrison-type scenarios, which the mentor would discuss with the captains. As with the first module, small-group leaders would ensure that the mentors received read-ahead packets and would coordinate for time available to conduct the mentor sessions.

During the tactics module, the mentors (divided into teams, which would require four or five mentors) could spot-check the planning, as the captains learned the MDMP. The class would receive the mission and begin to plan, with input from the team's assigned mentor. The input would pertain to the mission and planning (teacher/trainer). The first mission analysis brief should be a walk-through with the mentor to ensure that the captains are heading in the right direction.

There would be times established for when the mentor would be available to assist in the MDMP with the captains, for either the current or the next mission. The mentor would receive at least one brief (mission analysis, course of action analysis/approval, or operation order [OPORD]), and for each mission during the phase, would assist with refining the team's planning process. Additionally, with the availability of a mentor, the team would be able to plan the more complex/full-spectrum operations that the Army is facing worldwide. The mentor would assist the small-group leader by providing input on potential missions and training conducted with the captains. The capstone for this portion of training would be an OPORD brief to the mentor from the captains on the final task force mission.

Mentorship during the construction module could focus again on the more mundane, yet time-consuming activities of company command. The mentors would again meet with the captains, at least twice during the module, to discuss the issues of taking command and making that command successful—through topics at the discretion of the mentor. The last sessions with the mentor would allow the captains to ask questions not conceived of earlier in the course, helping to send the captains forward with confidence. The captains would also have a point of contact that they feel comfortable with after they leave the ECSC—should issues arise.

In addition, the ECSC student would establish a command relationship with the battalion commander or a senior leader of the student's follow-on unit. The receiving commander should send the student the command philosophy, top five training focus areas, and additional information to help the student. This commander could also be involved in the incoming captain's command philosophy developed during the common core module. Instead of a “check-the-block” memo, there would now be a document, approved by the captain's future commander.

The mentoring process needs to extend throughout the ECSC, from the first weeks of common core and leadership fundamentals, through tactics, and then finish with construction. It would ensure that captains understood their battalion commanders' intent and philosophies before conducting those first crucial inventories upon assuming command.

To maximize the opportunities created by the captain mentorship program, all captains must be involved in mentoring lieutenants attending the Officer Basic Course. Captains should discuss personal lessons learned, as well as secondhand experiences from their mentors and future commanders. Lieutenants now have a point of contact to ask questions and gain useful insights into their future jobs. The class schedule should allot time for the mentorship program. In addition, captains and lieutenants should get together at functions such as leader lunches and right-arm nights (where everyone meets at the officers club). The program would be a success if school leaders made it a priority.

Summary

A new breed of creative, adaptable leaders exists in the Army's junior officer ranks. It is vital that senior leaders recognize and support the methodology by which their junior officers accomplish real-world missions. Further, it is essential for Army leadership courses to encourage adaptable thinking and to prepare young officers for nontraditional leadership roles. In order to better train leaders on adaptability, leadership courses should train on irregular leadership roles, provide a compilation of AARs and lessons learned from deployments, and establish a more in-depth mentor program.



Captain Dickey serves as battalion S4 for the 30th Engineer Battalion. His previous assignments include platoon leader, assault and obstacle platoon leader, S2, S4, and executive officer. He holds a bachelor's in construction management from East Carolina University and a master's in engineer management from the University of Missouri-Rolla.

Captain Evans serves as the engineer reconstruction cell liaison officer to the International Zone. His previous assignments include Sapper platoon leader, light-equipment platoon leader, battalion S1, and work in the Battalion Assistant Division Engineer Cell. He holds a bachelor's in psychology and criminal justice from the University of Georgia and a master's in public administration from Webster University.

Captain K. Lewison serves as the S1 for 164th Air Traffic Services Group in Korea. Previous assignments include aviation line company platoon leader and battalion S4. She holds a master's in public policy administration from the University of Missouri-St. Louis.

Captain T. Lewison serves as an aviation operations officer for the Eighth U.S. Army in Korea. Previous assignments include aviation line company platoon leader and executive officer. He holds a master's in public policy administration from the University of Missouri-St. Louis.

Captain Miletich serves as an observer-controller/trainer team chief in a training support battalion. Previous assignments include platoon leader, task force engineer, and executive officer for the 3d Infantry Division. He holds a bachelor's in business administration from Presbyterian College and a master's in public administration from Webster University.

Captain Nye serves as a small-group instructor for the Engineer Officer Basic Course. Previous assignments include line platoon leader and assault and obstacle platoon leader. He holds a bachelor's in biology from Baker University.

Captain Rose is a training, assessment, and counseling officer for Bravo Company, 3-11 Infantry Regiment (OCS) at Fort Benning, Georgia. Previous assignments include line platoon leader and assistant S3. He holds a bachelor's in English literature from Washington University and a master's in public policy from Webster University.

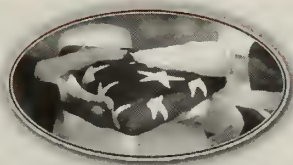
Captain Russell is a planner in the Future Plans G3, Eighth U.S. Army Korea. Previous assignments include task force engineer in Kosovo. He holds a master's in public administration from Webster University.

Endnote

¹ The authors are members of ECSC 03-04: Captain Jason Dickey, Captain David Evans, Captain Katrina Gier Lewison, Captain Tyler Lewison, Captain Matthew Miletich, Captain William Nye, Captain Tim Rose, and Captain Timothy Russell.

² Leonard Wong, "Developing Adaptive Leaders: The Crucible Experience of Operation Iraqi Freedom," Carlisle Barracks, Pennsylvania: Strategic Studies Institute, 2004, p. v.

³ *Engineer* encourages submission of articles. Check the Web site at <http://www.wood.army.mil/engrmag/submit%20article.htm> for the Engineer Writers Guide, which gives more information on article requirements.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since the last issue of *Engineer*. We dedicate this issue to them.

Staff Sergeant Christopher W. Dill	1st Brigade, 98th Division	Pennsauken, New Jersey
First Sergeant Timothy J. Millsap	70th Engineer Battalion	Fort Riley, Kansas
Corporal John W. Miller	224th Engineer Battalion	Burlington, Iowa
Sergeant Timothy C. Kiser	340th Forward Support Battalion	Red Bluff, California
Specialist Derrick J. Lutters	891st Engineer Battalion	Pittsburg, Kansas
Sergeant Gary A. Eckert, Jr.	983d Engineer Battalion	Monclova, Ohio

2005 Army Deployment Excellence Awards



By Mr. Charles K. Ledebuhr

The Army's Deployment Excellence Award (DEA) program witnessed a year of firsts in 2005. The program, established by the Army Chief of Staff in 2001 to recognize Active, Reserve, and National Guard Army units and installations for deployment excellence, has grown in participation every year since then. The Army's operational tempo, coupled with growing unit awareness of the DEA program, made it a banner year with the largest level of participation ever—fifty-eight units and installations—competing in the following categories:

- Large unit (battalion and above)
- Small unit (company and below)
- Supporting unit
- Installation (all Army)
- Operational deployment

For the first time, the Army Supply, Maintenance, and Deployment Award programs were combined into one ceremony—the Combined Logistics Excellence Award ceremony. Held on 19 May 2005 at the Marriott Wardman Park Hotel in Washington, D.C., the ceremony was part of the Association of the United States Army Logistics Symposium and Exhibition. The Army Vice Chief of Staff, General Richard A. Cody, presented the DEAs to the honored units. He was assisted by the Army Deputy Chief of Staff for Logistics, G4, Lieutenant General Claude V. Christianson, and the Army Chief of Transportation, Major General Brian I. Geehan. The awards banquet was highlighted with a speech by the Sergeant Major of the Army, Kenneth O. Preston.

Also for the first time, the program recognized a division as the winner of the Active Army large-unit category. This year, the 10th Mountain Division—from Fort Drum, New York—competed and won as the Army's best large deploying unit, based on a nomination package prepared by the Division Transportation Officer. This groundbreaking action by the 10th opens the way for other divisions to compete as large deploying units. Another first was that a single state—Oregon—swept the National Guard large and small deploying categories. Oregon entered and placed two units in each category. The Joint Forces Headquarters—Oregon deserves a

hearty congratulation for this exceptional achievement and presents a challenge for other states to showcase the deployment success of their units.

The combination of an installation winner and a supporting unit winner with a common mission was another first for the DEA program. This honor was shared by Fort Hood, Texas, and the 4003d Garrison Support Unit. Fort Hood won in the all Army installation category, while the 4003d won the Reserve supporting unit category for its support of deployment operations at Fort Hood, Texas.

In the operational deployment category—which is open to all Army units that deploy on missions such as the Global War on Terrorism, peacekeeping, humanitarian relief, and other operational deployments—units can contend for either the large- or small-unit category. This year the first unit from overseas won in the operational deployment category. In fact, the 1st Battalion, 38th Field Artillery Regiment, is the first unit from Korea to win any DEA. And although 2005 was a year of many firsts, representatives from combat, combat support, and combat service support units were in the winner's circle again. Command emphasis on deployment training, both collective and individual, was common to the winning units. Additionally, winning units treated deployment and deployment support as an operation, rather than as a logistics function.

Key dates for the 2006 DEA competition are as follows:

- Competition period: 1 December 2005–30 November 2006
- DEA operational on-site visits: 1 December 2005–1 February 2006
- Nomination packet due to unit's major command (MACOM): 1 January 2006
- MACOM nominations due to DEA board: 31 January 2006
- DEA board convenes: 6–17 February 2006
- Department of the Army (DA) releases message announcing semifinalists: 26 February 2006
- DEA validation teams visit: 1–25 March 2006
- DA releases message announcing winners: 1 April 2006

2005 Deployment Excellence Award Recipients		
Category	Winner	Runner-Up
Active Large Unit	10th Mountain Division Fort Drum, New York	84th Engineer Battalion Schofield Barracks, Hawaii
Active Small Unit	96th Transportation Company Fort Hood, Texas	Headquarters and Headquarters Company 89th Military Police Brigade Fort Hood, Texas
Active Support Unit	842d Transportation Battalion Beaumont, Texas	39th Transportation Battalion Kaiserslautern, Germany
National Guard Large Unit	2d Battalion 162d Infantry Regiment Eugene, Oregon	3d Battalion 116th Armored Cavalry Regiment LaGrande, Oregon
National Guard Small Unit	G Troop 82d Cavalry Regiment Redmond, Oregon	1186th Military Police Company Salem, Oregon
National Guard Support Unit	Camp Atterbury Edinburgh, Indiana	Joint Forces Headquarters—Illinois Springfield, Illinois
Army Reserve Large Unit	1179th Transportation Brigade Fort Hamilton, New York	1190th Deployment Support Brigade Baton Rouge, Louisiana
Army Reserve Small Unit	319th Transportation Detachment Dover, Delaware	281st Transportation Company Las Cruces, New Mexico
Army Reserve Support Unit	4003d Garrison Support Unit Fort Hood, Texas	139th Deployment Support Brigade Oceanside, California
All Army Installation	Fort Hood, Texas	Fort Drum, New York
Operational Deployment Large Unit	1st Battalion 38th Field Artillery Regiment 2d Infantry Division Camp Stanley, Uijeongbu, Korea	NA
Operational Deployment Small Unit	F Company 3d Battalion 69th Armored Regiment 3d Infantry Division Fort Stewart, Georgia	NA

DEA program guidance and evaluation criteria are available on the DEA Web site at <http://www.deploy.eustis.army.mil/DEA/default.htm>. For additional information, call your MACOM DEA point of contact or the DEA Program Manager, Mr. Henry H. Johnson, at DSN 927-1833 or commercial (757) 878-1833.



Mr. Ledebuhr is Chief of the Operations and Training Branch of the Deployment Process Modernization Office at Fort Eustis, Virginia. Retired from the Army, his service as a Transportation Corps officer included assignments with the 3d Armored Division, III Corps, Training With Industry, and 1st Armored Division.



Joint-Service Beach Obstacle Demolition in World War II

By Mr. James Douglas O'Dell

Combined into *gap assault teams* to clear beach and underwater obstacles in the landings at Normandy in June 1944, Army combat engineers and naval combat demolition units (NCDUs) experienced D-Day like everyone else—terrified beyond measure. What they have yet to receive is full recognition for their joint accomplishment. Some accounts say that the engineers were augmented by NCDUs, while others say that the naval units were augmented by engineers. Both accounts are correct—it was a team performance.

A gap assault team consisted of twenty-eight Army engineers and an NCDU made up of a Navy officer and twelve enlisted men—seven Navy and five Army. Also called *boat teams*, the NCDUs went into action with engineer combat battalions, assigned to regimental combat teams (RCTs). As part of Assault Force "O," the 299th Engineer Combat Battalion was attached to the 16th RCT and the 146th Engineer Combat Battalion to the 116th RCT. Assault Force "U," operating from VII Corps, was organized along the same lines.

Before World War II, no one had experimented with the demolition of massed obstacles in amphibious assault. Tasked with developing the use of obstacles in defense between the World Wars, the Corps of Engineers had a grasp of practical problems by the end of 1942. They had been experimenting with underwater demolition for two months at an amphibious training base in Florida, when in May 1943 the Navy announced the creation of its own combat demolition program.



Photo in This Is JANET, October 1945

Captain Alfred G. Hoel Jr., Corp of Engineers was instrumental in the establishment of the Joint Army-Navy Experimental and Testing Board (JANET).

Striving to develop a joint amphibious doctrine, the Army and the Navy joined forces, each surrendering some of its traditional autonomy, but never unconditionally. To the dismay of political leaders intent on controlling the cost of the war, the two services continued to inaugurate duplicate programs. Wherever the Army went, the Navy was sure to follow, straining to take the lead in all things amphibious.

The Navy's ascendancy in landing operations put the future of the Engineer Amphibian Command in doubt. Acquiescing to the transfer of authority, one engineer expressed optimism, seeing

it as a challenge for the Navy not to undo previous achievements, but to build on them. In a memo dated 25 February 1943, Lieutenant Colonel Paul W. Thompson stressed the need for trained personnel who were fully aware of American amphibian doctrine at assault training centers in England. Seeking to promote continuity, he noted that the Engineer Amphibian Command had developed "a workable doctrine." His understanding of the impending change was that the Navy would "simply absorb the personnel and facilities of the Engineer Amphibian Command," basically adhering to the established doctrine and

technique. In sum, he anticipated "a change in form rather than in substance."¹

With respect to the demolition of beach and underwater obstacles, the Navy elected to start from scratch, disregarding what the engineers had previously accomplished. The engineers made significant contributions, beginning with obstacle experiments predating the amphibious exercises that nurtured the Fleet Marine Force in the 1930s. Beginning in 1923, the Corps of Engineers developed beach and underwater obstacles for island defense in the Philippines and Hawaii—starting with steel *chevaux-de-frise*, barbed wire, and small mines. Coral formations off Oahu and Corregidor made it difficult to install heavy steel obstacles, but by August 1933—with the armed forces of various nations using heavier equipment—the engineers were forced to reconsider heavier obstacles.

While keeping tabs on German and Japanese amphibious operations, the engineers accumulated useful data on tactics and equipment. In February 1941, the Engineer Board started a project to investigate general demolitions. On 8 May 1941, the Chief of Engineers proposed that the board find a location for experiments in beach and underwater obstacle techniques. In late August and early September 1942, to guide research, the board composed a list of the military characteristics of effective underwater obstacles. A study of a working classification of existing types resulted and convinced the Chief of Engineers to authorize Project DM 361, *Underwater Obstacles*, on 22 September.

Beginning in late 1942, experiments were conducted at a temporary site at Camp Bradford, five miles northeast of Norfolk, facing the Chesapeake Bay. Over the winter of 1942–43, a variety of obstacles were tested, including horned scullies.² Based on work at Camp Bradford, the board made preparations for establishing a test site at Fort Pierce, Florida, authorizing a survey of North Island (now known as *Hutchinson*), conducted on 25–26 February 1943. A newly established naval amphibious



Photo courtesy Kenneth B. Reynolds

Engineers launch into the surf with a nitrostarch charge, preparing to blast a sandbar, 1 March 1943. Amphibious Force, Atlantic Fleet Photo AFAP-X 735.

training base on South Island (also known as *Hutchinson*), combined with excellent beach and surf conditions, made North Island ideal for a joint-service program—where the Army began a demolition school.

On 8 March, the Chief of Engineers specified that the test area be located close to the naval base, directing the board to coordinate work with a similar project in the United Kingdom. On that same day, Report 740, Project DM 361, *Underwater Obstacles* (covering the work at Camp Bradford), was completed, and the board opened Project DM 361E, *Demolition Equipment for Removing Beach and Underwater Obstacles*. At Fort Pierce, engineers experimented with ways of blasting channels through sandbars—at that juncture, the only underwater obstacles known to exist at potential landing beaches in Axis (Germany, Italy, and Japan) territory.

Since offshore bars were obstacles to boat traffic, the Navy argued for jurisdiction. Heavily engaged in the development of their own landing craft, the engineers sought a compromise based on joint responsibility. The elimination of obstacles, extending to natural features, was a logical adjunct to combat engineering, Army or Navy. Both services coveted the capability and the freedom to operate according to their

respective doctrines. Acquiring responsibility for all amphibious training and landing craft production, the Navy sought total control over landing operations. Essentially, the Navy was responsible for getting troops and supplies on the beaches, while the Army was responsible for getting them off the beaches. From that perspective, the elimination of all obstacles to navigation was a logical extension of naval activity. In the sense that a landing beach could develop into a makeshift port, the clearance of underwater obstacles fell under an existing interservice arrangement, but there was a problem.

In the spring of 1943, the Navy had nothing comparable to the obstacle research base compiled by the engineers over the previous two decades—or a demolition school. Responsible for port clearance—principally, the removal of mines, torpedoes, and wrecked vehicles—the Navy did have training facilities for ordnance disposal. In addition to the Mine Disposal School, as of late 1941, there was the Bomb Disposal School—established and headed by Lieutenant Commander Draper Laurence Kauffman, U.S. Navy Reserve (USNR). He knew something about demolition specific to ordnance disposal, but he was not a demolitions expert. For expertise on demolitions,



Photo courtesy Albert J. Sankie

This experimental beach and underwater obstacle course was constructed at North Island, Fort Pierce, Florida, in April 1943.

planners could look to the Naval Construction Battalions, or Seabees, skilled in the use of explosives for building purposes.

Neither bomb disposal technicians nor Seabee builders were classed as combat troops trained for assault. The Marines were, but the Navy wanted to confine them to the seizure of ports, their traditional assignment. In the Pacific, that came to include entire islands, such as the Solomon Islands where Marine engineers experimented with combat demolition. Given their assignment to secure ports, and considering that landing beaches could serve as ports, Marines were logical candidates for demolition training. Nevertheless, Navy planners thought of Marines as an inert force until they actually hit the beach. In that sense, the only active units in the surf zone were landing crafts, which included amphibious tractors, able to surmount a coral reef but having a limited capacity to deal with artificial obstacles.

In the wake of the landings in North Africa in November 1942, the Allies gave some thought to the possibility that the Axis might make greater use of artificial

barriers extended into the surf zone. Examining the results of beach marking by amphibious scouts in Operation Torch, Admiral H. Kent Hewitt decided to expand their capabilities to include onshore reconnaissance. In a memorandum to the Commanding General of the Army Ground Forces, dated 18 February 1943, he requested a specially organized company of engineers (including a demolition platoon) to assist in the development of particular projects in amphibious technique. He wanted the unit to be available by 1 March at the latest. At the top of the list was "the training of Scouts and Raiders in the technique of investigating and destroying beach and underwater obstacles."³

Established in September 1942 at Little Creek, Virginia, and moved to Fort Pierce in January 1943, the joint-service Amphibious Scout and Raider School was not designed to train raiders in the usual sense, but as reconnaissance specialists, skilled at gathering intelligence behind enemy lines without revealing their presence. The fact that Admiral Hewitt directed his request to

the Army, and not the Navy, is significant. Clearly, he saw the need for a combat demolition capability with respect to underwater obstacles, recognizing that the Navy, as yet, did not have one.

On 17 March 1943, the Engineer Board informed the Chief of Engineers that Captain Clarence C. Gulbranson—U.S. Navy Commandant of the Amphibious Training Base, Fort Pierce—had submitted a request for "the immediate construction of a sample underwater obstacle course" for use in the preliminary training of combat personnel in the Amphibious Force, Atlantic Fleet (AFAF). Supervised by the district engineer, civilian contractors completed the course by the end of April.

By early spring, the Army and the Navy had begun to discuss joint responsibility for the passage of beach and underwater obstacles in the assault. In a memo to Army Ground Forces, dated 17 April 1943, an officer of the General Staff, Army Service Forces, wrote, "Steps to obtain a joint decision on the delineation of responsibilities have been

initiated by the Navy, and a decision is expected in the near future."⁴

On 1 May, the engineers recommended the immediate construction of an obstacle course, and by 1 July, it was ready for experimental testing. Colonel James H. Stratton, head of the Engineering Division, on 29 June wrote that the course would not be used to train troops. The Chief of Engineers requested a revised plan for Project DM 361E, with emphasis on the passage of beach obstacles and continued co-operation with the AFAF, in developing techniques in the passage of underwater obstacles. Submitted on 7 July, the revised plan was approved within twelve days.

The emphasis on beach obstacles did not herald a total shift away from underwater obstacles, although another critical development in early May 1943 applied pressure in that direction. Admiral Ernest J. King, Chief of Naval Operations (CNO), formally announced a plan to establish a program to train NCDUs. With no reference to the Army's efforts, the CNO said simply that it made sense to prepare for the eventuality of having to achieve passage through underwater obstacles on enemy

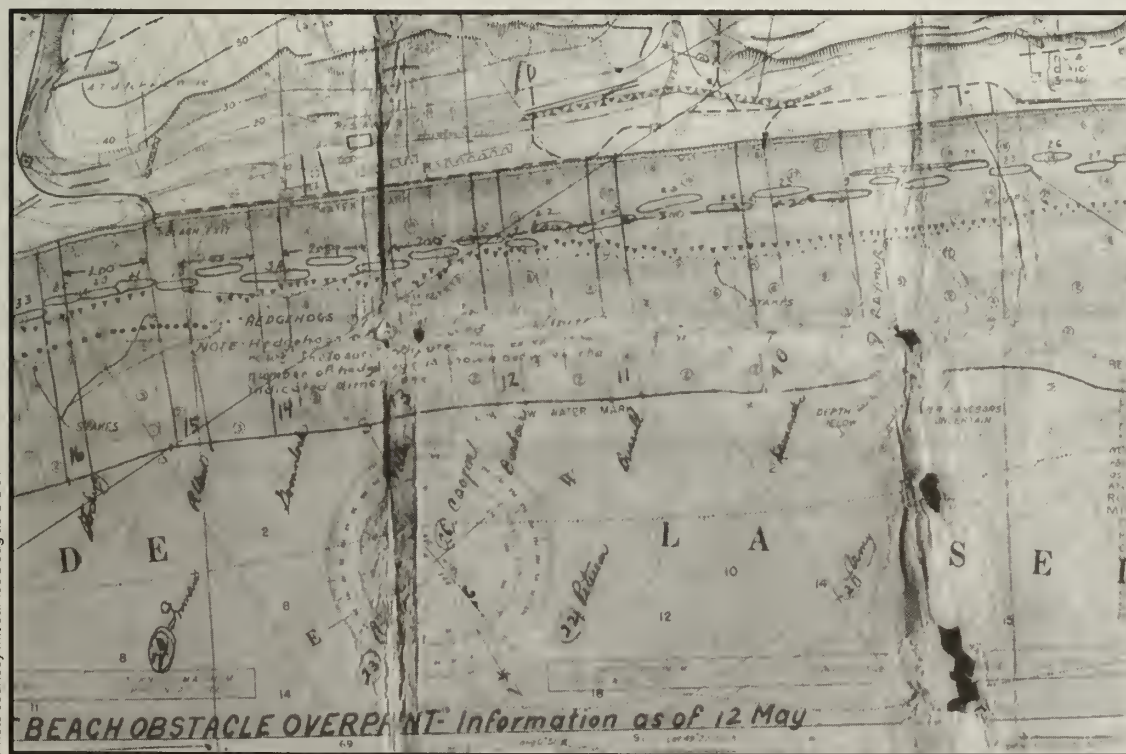
beaches—basically, the Navy thought it was a good idea.

Citing an "urgent" requirement, the CNO tasked Lieutenant Commander Kauffman to find a suitable location and commence training. Kauffman organized a training cadre and established the NCDU Project at the Amphibious Training Base, Fort Pierce, in early June. The engineers appeared to take the situation calmly. Speaking to an assembly at the Assault Training Center, European Theater of Operations, on 31 May 1943, Lieutenant Colonel Edwin P. Lock, Corps of Engineers said, "I understand that this task is assigned to units of naval demolition engineers." He assured his colleagues in the United Kingdom that "the program for the development and means of passing underwater obstacles is being undertaken jointly by the Army engineers and the Navy." In reference to the long-standing arrangement, Lock explained, "The Army engineers are responsible for the technique of underwater obstacles in the defense, hence their interest in the project."⁵

The Army did not want to transfer all responsibility for removing underwater obstacles to the Navy. As Colonel Lock

explained, "In an operation of this nature, it is wrong to assume that one or the other service is assigned full responsibility, since the planning and training are joint responsibilities." More pointedly, "Planning must designate the removal of specific obstacles by specifically designated units."⁶ At this point, a problem arose in the negotiations over the division of labor. Depending on the state of the tide, obstacles on the foreshore rested upon dry land. The Navy wanted jurisdiction over anything that, by definition, was an obstacle to navigation. Basically, that included everything below the high-water mark. The Army thought it made more sense for the Navy to tackle obstacles that were submerged at the time of the landing. According to the engineers' definition, those were truly *underwater* obstacles.

Eventually, Admiral King had to concede that shifting tides made it difficult to referee responsibility for removing underwater obstacles: "The Commander in Chief, U.S. Fleet, agrees that underwater obstacles may, under certain conditions, be above water and also may not be technically separable from other obstacles in the landing



This is a portion of an actual chart used by a naval combat demolition unit officer in the assault on Omaha Beach, 6 June 1944.

area.”⁷ The engineers sought to avoid duplication of effort, either with respect to cooperation with the Navy or their own demolition research projects. The prime directive was to maintain close coordination of all amphibious preparations.

As stated on 21 January 1941, Admiral King’s philosophy of command embraced the concept of individual initiative within the framework of an effort coordinated with other components of the fleet. Echelon commanders were to be told what to do, but not how to do it, unless circumstances warranted otherwise. Clarifying this position three months later, he said, “When told ‘what’ to do—make sure that ‘how’ you do it is effective, not only in itself but as an *intelligent, essential, and correlated part of a comprehensive and connected whole*.”⁸ On the surface, this would seem to have placed the Army and the Navy on the same page, but beneath the tacit agreement to cooperate in amphibious preparations lay the determination to continue separate efforts at separate, if also contiguous, sites. Duplication was the order of the day, but so was interdependence. In a letter dated 3 August 1943, Brigadier General C. L. Sturdevant noted, “The passage of beach and underwater obstacles is a subject about which little is known.” Emphasizing the importance of the experimental work at Fort Pierce, he wrote, “The Navy, for the time being, is largely dependent upon the Chief of Engineers for such development.”⁹

At Fort Pierce, the 299th learned techniques from the NCDUs, demonstrated there in February 1944. Otherwise, the Army and the Navy maintained separate training regimes and sites on North Island. It was nearly the eleventh hour before Army engineers and Navy demolition units participated in joint exercises on a realistic scale in the United Kingdom.

According to the final draft of the operational plan for Normandy, Navy personnel were “entirely responsible” for removing obstacles that were *submerged at the time of the landing*—as the engineers had wanted from the

start. Army personnel were not expected to disengage from work on obstacles that were being engulfed by the tide. The arrangement proved satisfactory. A Navy observer rated the cooperation between Army and Navy demolition units on D-Day as “virtually perfect.”¹⁰

Mr. O’Dell is a freelance writer and former editor of FIRE IN THE HOLE!, the newsletter of the UDT-SEAL Museum Association, Inc. He holds a bachelor’s in anthropology and a master’s in history.

Endnotes

¹Lieutenant Colonel Paul W. Thompson, Corps of Engineers, Memo No. 8 to General Barker, 25 February 1943, p. 1 (National Archives, Textual Reference Division, Military Reference Branch, Suitland, Maryland.).

²Report 740, Project DM 361, *Underwater Obstacles*, Engineer Board Study No. DM 361, 8 March 1943, submitted to the Engineer Board, Fort Belvoir, Virginia. File AD-B957 600, records of U.S. Army Engineer School, Fort Leonard Wood, Missouri.

³Rear Admiral Henry Kent Hewitt, U.S. Navy, Commander, Amphibious Force, U.S. Atlantic Fleet, to Commanding General, Army Ground Forces, Army War College, Washington, D.C., 18 February 1943. Records of U.S. Army Engineer School, Fort Leonard Wood, Missouri.

⁴Memorandum for the Commanding General, Army Ground Forces: Subject: Beach Assault Training, 17 April 1943. Records of U.S. Army Engineer School, Fort Leonard Wood, Missouri.

⁵Lieutenant Colonel Edwin P. Lock, Corps of Engineers, U.S. Army, Discussion of address of 31 May 1943, Assault Training Center, European Theater of Operations, U.S. Army (National Archives, Textual Reference Division, Military Reference Branch, Suitland, Maryland.), pp. 3-4.

⁶Ibid., 3.

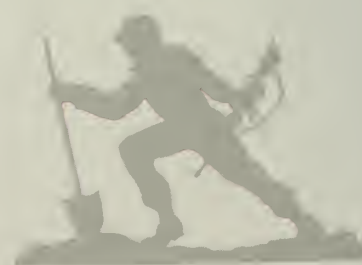
⁷Commander in Chief, U.S. Atlantic Fleet, “A History of the Amphibious Force,” p. 81.

⁸Commander Walter Muir Whitehill, USNR, “A history of the organization and administration of Headquarters, Commander in Chief, U.S. Fleet, December 1941 to October 1945.” *Headquarters* (Operational Archives, Naval Historical Center, Washington, D.C., 1946, microfiche, pp. 7-12).

⁹Brigadier General Clarence L. Sturdevant, Corps of Engineers, to Commanding General, Fort Belvoir, 3 August 1943. Records of U.S. Army Engineer School, Fort Leonard Wood, Missouri.

¹⁰Operational Order No. 3-44, 15 May 1944, p. 1; Lieutenant (jg) H.L. Blackwell Jr., Report on Naval Combat Demolition Units in Operation Overlord, July 1944 (Operational Archives, Naval Historical Center, Washington, D.C.), p. 16; Lieutenant Commander Herbert A. Peterson, D-V(G), USNR, Commander, Task Group 125.2.3, to Naval Commander, Western Task Force, Report of Operations (Operational Archives, Naval Historical Center, Washington, D.C.), p. 3.

Note: This article is condensed from The Water Is Never Cold: The Origins of the U.S. Navy’s Combat Demolition Units, UDTs, and SEALs by James Douglas O’Dell (Brassey’s, Inc., 2000, 2001), and unpublished data from a work in progress.



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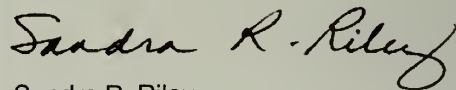
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U.S. Army engineer
Soldiers in urban and
complex terrain -
then and now.

Back Cover:

Sergeant First Class
Paul R. Smith, Medal of
Honor recipient



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Clear The Way

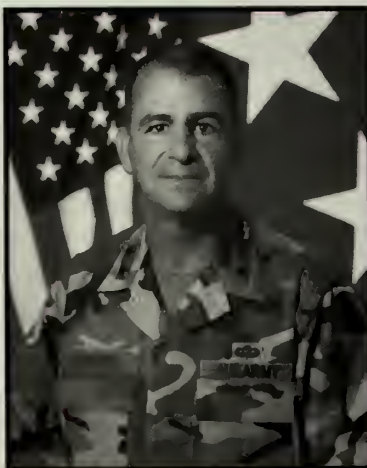
By Major General Randal R. Castro
Commandant, United States Army Engineer School



Welcome to our latest issue of *Engineer*. Greetings to all of you who are serving from all around the globe. And thank you for taking the time to sit with us and read the latest experiences from the great Soldiers in our Regiment. Each of you performs a vital job across the force, and I want you to know I appreciate the role each of you plays in making the Army function from day to day. Without you, we could not accomplish all that we have. I want to thank you all for what you do for our Regiment and our country.

As we approach four years of fighting the Global War on Terrorism, we are busy as ever, trying to synchronize major events for our Army and the Engineer Regiment. I know most of our engineers are either deploying, deployed, or recently deployed. Many of you will also be a part of the Base Realignment and Closure (BRAC) reorganization and Integrated Global Presence and Basing Strategy, which will move forward-stationed units to CONUS-based posts. While we do all these deployments and movements between installations, we are going to use this inertia to transform the Regiment in conjunction with the Army's efforts to modularize into brigade combat teams (BCTs), units of employment-tactical (UEX), and units of employment-operational (UEY). We received great news recently that the Vice Chief of Staff of the Army approved the Future Engineer Force Update. It is a significant event for our Army and will require everyone's efforts to accomplish.

Now more than ever, we have the ability to keep you informed on what is happening around the Regiment. I have spoken to you all recently on a number of subjects that can be found on our Engineer School Web site at <http://www.wood.army.mil/eschool/>.



Another tool that we are leveraging to provide you relevant information is "The Engineer Blast." It is a bimonthly e-mail newsletter that provides current news and updates throughout the Regiment. If you have not seen it, ask your unit leadership to pass it down to you.

This issue is focused on engineer operations in urban and complex terrain. It is one of our greatest challenges in theater today, and we must become proficient in understanding assured mobility in this environment. We have had some great articles from the folks that are making things

happen. We will continue to address this subject at our Army Engineer Association Conference, 24-27 October 2005, in Orlando, Florida. I look forward to seeing our Regiment's leadership there to share their experiences and lessons learned. I want to take your feedback and return to the Engineer School and spiral your ideas into our doctrine and lesson plans for our Soldiers and young leaders.

We want to continue making this a viable and relevant professional bulletin. Continue to submit your articles and share your experiences and lessons learned with the Regiment.

As I close this message, I ask you to take a deep breath, let it out slowly, and relax. Don't forget what is important... I want you to remain balanced in your lives, contribute to your team of teams, and passionately make a positive difference wherever you serve.

Thanks again for all you do for our Regiment and the Army!
Essayons!

Carry On!

.....

The back cover of this issue of *Engineer* and the poster in the center are a tribute to Sergeant First Class Paul Ray Smith, an engineer Soldier and the recipient of the first Medal of Honor for service during Operation Iraqi Freedom and the Global War on Terrorism. Sergeant Smith, whose selfless service to his country was the epitome of the Warrior Ethos, has brought great honor to the Army and to the Engineer Regiment.

Lead The Way

By Command Sergeant Major Clinton J. Pearson
United States Army Engineer School



I would like to begin by saying thanks for the great work by all of the great sappers across the globe. I'd also like to extend a warm welcome to the new leaders within the Engineer School. What a super team we have!

During my travels throughout the previous quarter, I witnessed officers, non-commissioned officers (NCOs), and Soldiers doing an outstanding job supporting our nation and our Army at war. In June, for example, I participated in training with students of the Urban Mobility Breaching Course (UMBC) at Camp Lejeune, North Carolina. The details of this course are in the Engineer Update on page 38. I am soliciting your help to send as many NCOs as possible to the UMBC.

Another course I ask you to support is the Explosive Ordinance Agent Course (EOAC) at Redstone Arsenal, Alabama. In this course, students learn to identify, categorize, and destroy captured enemy ammunition (CEA), improvised explosive devices (IEDs), and unexploded ordnance (UXO). It bridges the gap between explosive ordnance disposal (EOD) personnel and engineers.

Three courses offered here at Fort Leonard Wood are the Sapper Leader Course and the Unit Searcher and Unit Search Advisor Courses. These courses help produce some of our Army's best small-unit leaders and greatly improve their ability to operate in an urban environment.

Just two years ago, the only specialized course offered by the Engineer Regiment was the Sapper Leader Course. Today, we present a myriad of courses. It is imperative that we continue to send Soldiers to these courses. I have talked to many leaders and Soldiers in the field who stated that these courses are making a difference in their confidence and ability to perform their wartime missions.

I also participated in training with our engineer divers in Delta Company, 577th Engineer Battalion, at Panama City, Florida. I was thoroughly impressed by the extensive training students go through to become divers. Soldiers attend Phase I of the training at Fort Leonard Wood and Phase II at the Naval Diving and Salvage Training Center at Panama City. This training requires a tremendous amount of mental and physical endurance. It is demanding and challenging and definitely prepares divers to conduct their wartime and peacetime missions. If you have Soldiers interested in



becoming engineer divers, visit the 577th's Web Site at <http://www.wood.army.mil/577th/Diver/index.htm> for information.

During August, I attended the 130th Engineer Brigade off-site in Germany. I visited the 1st Armored Division and 1st Infantry Division engineer units and learned about the challenges they're facing regarding transformation. I'm confident that we have the right command teams, at the right place, at the right time to get the job done. It was great to speak with the leaders and Soldiers, and it felt good to be out doing PT with the outstanding NCOs of the 82d

Engineer Battalion. I am extremely proud of all of you. A special congratulation goes out to Staff Sergeant Randolph Delaprema for being selected as Fort Sill's Drill Sergeant of the Year for 2005.

The good news transformation story is that this quarter we will witness the standing up of two engineer battalions: the 20th Engineer Battalion, consisting of three mobility augmentation companies (MACs), one sapper company, and two firefighting detachments (the 507th and 557th) at Fort Hood; and the 19th Engineer Battalion (Combat Heavy), consisting of two vertical companies, one horizontal company, and a survey and design team at Fort Knox. We'll also see two mine dog detachments, consisting of four mine dog teams, standing up at Fort Leonard Wood.

I look forward to seeing many of you at the upcoming Army Engineer Association (AEA) Conference in Orlando, Florida. To register, visit the AEA Web site at <http://www.armyengineer.com>. It will be great to meet with everyone and discuss the many topics that are on the agenda.

In closing, I would like to say that I am extremely proud of our Regiment's Soldiers for their contributions and positive impact over the past year. We owe this generation a great deal of gratitude and respect. I am especially proud of those sappers deployed around the world in harm's way—whether it's in Operation Iraqi Freedom or Operation Enduring Freedom or in support of the aftermath of Hurricane Katrina. These Soldiers and their families make tremendous sacrifices each and every day. To those 146 sappers who have paid the ultimate sacrifice in the cause of freedom, justice, and the American way of life—neither you nor your families will be forgotten. God Bless America!



By Captain Matthew Louvet

A contemporary operating environment forces today's leaders to truly be flexible and adaptive and to take initiative in completing all assigned missions. My own experience as a combat engineer company commander in Iraq reinforced the need to be able to adapt—accounting for the enemy, the terrain, and the mission—to the full spectrum of combat requirements. Engineer Soldiers and their leaders, uniquely skilled and equipped, must be prepared to execute combat operations to include “traditional” engineer tasks in an urban environment and, when required, to “put down the shovel and pick up the rifle” and “fight as engineers.”

Much of my own experience in Iraq was in fighting as an engineer. Field Manual (FM) 7-8, *Infantry Rifle Platoon and Squad*, served as a solid foundational document during predeployment training and on-the-ground mission preparations. This manual provides the necessary information, laid out in a very comprehensible format that can be adapted to fit almost any situation. Two additional references that are useful are FM 3-06.11, *Combined Arms Operations in Urban Terrain*, and Army Training and Evaluation Program (ARTEP) 71-1-MTP, *Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team*.

Engineer companies must be capable of conducting urban combat operations such as raids and cordon-and-search missions. Both are complex and require dedicated planning and focused mission rehearsals before execution. Enabling tasks for these operations include hasty- and deliberate-planning processes, knowledge and understanding of the rules of engagement (ROE), direct-fire planning tools, distribution of graphics, and communications procedures that feed a common operational picture to enable true situational awareness.

As engineers prepare to conduct these missions, the tasks listed in the table below become required training. Engineer leaders must be ready to conduct these missions either as part of a combined arms team or as a ground-mission commander. They must understand the capabilities and limitations of

Enabling Tasks for Raids and Cordon-and-Search Operations		
Unit Level	Task Number	Task
Company	71-2-0308	Conduct a Raid
Company	71-2-2027	Conduct a Cordon-and-Search Operation
Collective Task	71-2-0320	Infiltrate/Exfiltrate
Collective Task	71-2-0221	Execute Actions on Contact
Collective Task	71-2-0222	Conduct Fire and Movement
Collective Task	71-2-0219	Attack by Fire
Collective Task	71-2-3061	Support by Fire
Collective Task	71-2-0322	Withdraw From Enemy Contact
Collective Task	71-2-2025	Clear a Built-Up Area
Collective Task	71-2-2324	Conduct Roadblock/Checkpoint Operations
Platoon Task	7-3/4-4113	Knock Out a Bunker
Platoon Task	7-3/4-4114	Clear a Trench Line
Platoon Task	7-3/4-4110	Clear a Building
Leader Task	061-283-6003	Adjust Indirect Fire



Combat engineers work on one of many construction projects.

task-organized units and how to best employ all team members to achieve mission success.

Raids, cordon-and-search operations, and tactical patrols (mounted and dismounted) are typical “fighting engineer” missions requiring detailed planning and using available forces correctly. The engineer commander must task-organize his force based on the target, the objective area, and the capabilities of his units. Required equipment includes building marking materials, detainee binding materials, detainee processing forms, and detailed target folders with pictures. Engineers need training on ROE, stack drills, room and building clearance procedures, and proper search and detainee handling procedures. Leaders must be flexible enough to transition from one mission to another based on enemy contact or the availability of actionable intelligence. For example, there were several occasions when platoons on patrol had to shift their focus and conduct raids. The majority of the raids conducted

were hasty with nonorganic units embedded into the patrol. These were “pickup teams” in every sense—enabled by capable leaders and well-known battle drills.

Tactical operations that integrate Iraqi security forces are becoming increasingly important for coalition forces. The toughest cordon-and-search operation that my company participated in included elements from a Macedonian special forces unit, the Iraqi civil defense corps, and the battalion headquarters. All inherent differences between these three units had to be worked out during the planning and execution of missions. Fire control, communications, common language and terms, and the integration of diverse units with varying skills and training readiness all had to be addressed to lower the risk. Detailed planning and rehearsals ensured safe and successful mission execution.

Engineer units are tasked to run combat patrols and establish traffic control points (TCP) during patrols. Leaders must brief all aspects of the mission and incorporate rehearsals into the mission timeline. Establishing a TCP is a planned event and requires wire, pickets, interpreters, detainee binding materials, detainee processing forms, phrase cards, and the local area be-on-the-lookout (BOLO) list with pictures. Related training includes establishing and manning checkpoints, conducting individual searches, conducting vehicle searches, and understanding ROE.

Although guard duty is not the most difficult job, it is a common task that must still be accomplished for the security of the unit. Living on a forward operating base (FOB) requires that the unit occupy at least a portion of the guard positions. Tasks that the engineer Soldier must know how to perform include completing range cards, completing a proper sector sketch, and conducting adjacent unit linkup to ensure overlapping fields of fire. Other tools needed include thermal sights, a compass (for reporting visual contact outside the perimeter and correctly filling out the range cards), and some type of communications device.

Manning an entry control point (ECP) on an FOB requires all the tasks and tools that are needed for guard duty plus some others. Part of manning an ECP is guarding it from unauthorized entry. The ROE must be understood at all levels—especially at an ECP with a high volume of traffic (both military and civilian). Language and proper use of an interpreter are



An engineer Soldier uses a handheld mine detector.

other specific types of training that would benefit Soldiers and leaders at an ECP. Wire is a necessary item if establishing an ECP but—as upgrades continue—HESCO® Bastions and concrete barriers provide additional force protection. Search areas at an ECP require mirrors for searching under vehicles and metal-detecting wands for personal searches. If the ECP is to continue operations during limited visibility, floodlights and flashlights for mirrors also need to be considered.

Combat engineers must be prepared to conduct general engineering tasks. Engineer leaders will routinely be required to conduct force-protection assessments and limited construction projects and have a working knowledge of project management. While most of my assigned construction missions were limited in scale, subordinate leaders needed the necessary skills and tools to be able to draw up a plan for the project, determine the bill of materials, supervise the construction, and conduct quality assurance and quality checks of the project.

Engineers must similarly have a working knowledge of basic environmental infrastructure—sewage, water, electricity, academics, and trash (SWEAT)—and some simple assessment checklists to determine project requirements. Engineers should have a working knowledge of how these systems work or at least the ability to acquire informational references. Leaders should look for what is currently in place, working, broken or missing, and needed to get the system running again to benefit the local area.

Breach and mine-detector teams are two specialty teams that the engineers can provide to both the raid and the cordon-and-search missions. These teams can vary in size, depending on forces available and the mission requirements, but they

each require a dedicated security element. The breach teams need to be trained in all manual, mechanical, and dynamic-entry techniques and methods to evaluate structures to determine the suitability of each. In addition to explosives, breach teams need a manual breach kit, including a man-packable, collapsible ladder. The mine-detector teams need to understand their equipment, to include correction operations procedures and system limitations. My company was often a force provider for combined arms missions, sending mine-detector teams with other units to find caches.

Terrain analysis continues to be a necessary and relevant skill for engineers. On numerous occasions, TerraBase, FalconView™, and MrSID® provided us with information on an area for combat operations so that we never went in unprepared. Additionally, these programs allowed us to evaluate our guard locations, ECPs, and guard towers and assess key terrain along lines of communication based on line-of-sight analysis and weapons range fans.

Engineers must always be ready to conduct technical and tactical reconnaissance. Whether assessing route trafficability or conducting bridge-span and load calculations, engineers in my company were regularly reminded of the technical requirements of their craft. Additionally, the requirement for tactical reconnaissance to identify threats to friendly mobility—whether enemy or improvised explosive devices (IEDs)—was an implied task for every movement and an increasingly important component of the unit's troop-to-task analysis.

As the Regiment continues its transformation, the key to success will be its leaders. The Regiment needs competent, confident, and flexible Soldiers and leaders empowered to take the initiative in any scenario. Engineer leaders must be properly skilled in unique, technical capabilities; trained and ready for full-spectrum operations; and equipped for success in traditional engineer tasks. When required—engineer leaders must fight as engineers. The Soldiers and leaders in my own unit, as well as those who fill the ranks of the Engineer Regiment, demonstrate daily that they are up to the task. *Essayons!*



Captain Louvet is the officer in charge of the Scorpion Team at the National Training Center, Fort Irwin, California, serving as a staff engineer trainer. Other assignments include Commander, Charlie Company, 5th Engineer Battalion, during Operation Iraqi Freedom in support of the 4th Infantry Division. He holds a bachelor's in wildlife resource management from West Virginia University and a master's in geology and geophysics from the University of Missouri-Rolla.



The mighty D9 dozer clears rubble in preparation for a reconstruction mission.

URBAN OPERATIONS TRAINING AT THE POWER PROJECTION PLATFORM “WELCOME TO AL WADI”

By Lieutenant Colonel John C. McClellan and Captain Eric M. Noe

Creating challenging, realistic urban-training environments for deploying units requires Army leaders assigned to training support battalions (TSBs) and brigades to adapt and innovate. Early in 2004, 2d Brigade, 91st Division (Training Support) (2-91st TSB), began planning postmobilization training to be conducted at Fort Bliss, Texas, for an Army National Guard brigade combat team (BCT). Accomplishing this goal required some out-of-the-box thinking by the leadership of 1st Battalion, 361st Engineer Regiment (Task Force Redhawk), which is part of 2-91st TSB. This article presents the scenario—and the lessons learned—used to achieve the complex effects of urban terrain and the design and execution of training for a deploying BCT.

Existing Fort Bliss Facilities

Although the Fort Bliss power projection platform (PPP) offered outstanding realism in time-distance factors, desert terrain, and weather, initial reconnaissance of base facilities revealed few that were suitable for patrols, close-quarters combat, or urban-warfare training. The base had range camps that could be converted into forward operating bases (FOBs), but lacked suitable training villages or military operations on urbanized terrain (MOUT) sites. So the observer-controller/trainers (OC/Ts) of the 2-91st TSB began transforming the base into a series of interlinked urban-training sites. These included mock villages, industrial centers, and FOBs capable of supporting squad- or platoon-level patrolling, company and battalion task force cordon-and-search operations, and close-quarters combat operations.

While at Fort Bliss, the 2-91st TSB initially occupied three mobilization base camps that were converted into replicas of the FOBs that deploying forces would occupy in theater. BCT maneuver task forces rotated through FOB Baker, located at Biggs Army Airfield. Two of the five BCT maneuver task forces were housed for 10 days at a time. The 2-91st TSB training concept required Task Force Redhawk to train basic patrolling techniques for the BCT's five maneuver task forces. The training included squad/platoon dismounted security patrols and quick-reaction-force operations and culminated in company raids and battalion task force-sized cordon-and-

search operations. A sister training battalion also trained them on mounted patrols and traffic control point operations.

The location of FOB Baker provided a unique opportunity to develop a training plan that would take full advantage of the only urban terrain available in the immediate vicinity—the base itself. In response, Task Force Redhawk created the fictitious province of “Al Wadi”—a combination of villages and urban areas designed to replicate an area of operations located on the outskirts of a large Iraqi city. The Fort Bliss garrison leadership supported the battalion and, for the first time in recent history, training lanes were created directly on Biggs Army Airfield, the adjacent railhead facility, and portions of the main cantonment area of Fort Bliss. Figure 1, page 8, shows the main post areas used for the urban-patrolling operations.

In order to use these main facilities to conduct training, rehearsals, and force-on-force blank-fire combat patrols, a detailed plan was briefed to the PPP and garrison leadership for approval. Several key controls were put into place to ensure the safety of the Blue Force (BLUEFOR) Soldiers, OC/Ts, permanent party Soldiers, and residents and employees of Fort Bliss. A copy of Figure 1 (along with an explanation of the training concept) was given to the garrison commander to provide situational awareness to all on-post agencies on the times and locations of our training patrols. Advance coordination with the provost marshal, airfield commander, Force Protection Office, Public Affairs Office, and various tenant agencies adjacent to the patrolling areas was critical to the plan's success.

The risk assessment for the operating plan included—

- Alerting Fort Bliss garrison agencies of the areas and times of patrol operations.
- Alerting the garrison Security/Force Protection Office and the Provost Marshal Office of the locations of all patrol routes, emplaced training improvised explosive devices (IEDs), mock ambushes, and drive-by shootings.
- Coordinating closely with the Provost Marshal Office throughout operations.

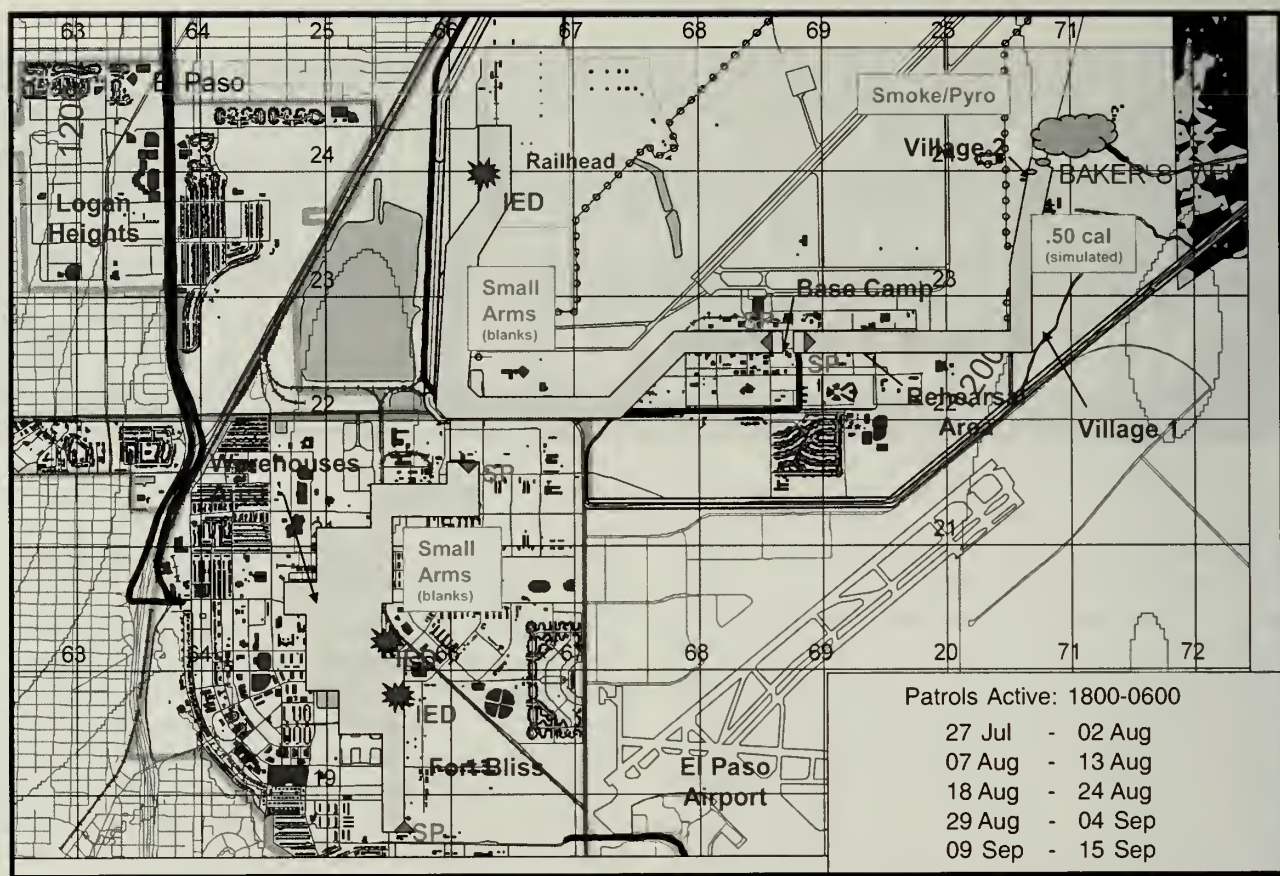


Figure 1. Map of the main post areas used for dismounted patrols

- Positioning OC/Ts in the front and rear of dismounted formations for traffic control.
- Specifying locations where blank-fire weapons, the Multiple Integrated Laser Engagement System (MILES), pyrotechnics, and simulated IEDs would be used.
- Planning routine policing of brass from blanks to prevent hazards to vehicles or pedestrians.
- Training and rehearsing for Opposing Forces (OPFOR) and contracted civilians on the battlefield.
- Adapting exercise rules of engagement to account for military and civilian personnel in the area who were not part of the training (but were a useful backdrop).

In addition, since most of the dismounted patrolling was conducted between 1800 and 0600 hours, limited visibility had to be considered and mitigated.

Creating Al Wadi

Within the Al Wadi area of operations, two major considerations drove the details of the intelligence scenario created to frame the insurgent activity that would operate there. The first was the close proximity of Biggs Army Airfield and the El Paso International Airport, and the second revolved around the Fort Bliss warehouse district and railhead.

Biggs and El Paso Airports

The training scenario presented a growing insurgent threat to coalition air operations at the two airfields that included anti-Iraqi force surveillance and fence line breaches, IEDs on coalition supply routes within the sector, and rocket/mortar attacks aimed at the FOB and the airfields. These activities disrupted coalition air operations and delayed the reopening of civilian air traffic (an interim government priority) at the "Al Wadi International Airport," still under coalition military control since the initial seizure. Thus, task force elements would need to patrol these areas, check fence lines, develop pattern analysis, conduct crater analysis, and locate insurgent firing positions in order to defeat the IED threat and rocket/mortar attacks and restore stability. BLUEFOR dismounted patrolling operations from the FOB included mounted quick-reaction force missions to reinforce dismounted security patrols, react to local demonstrations, or conduct downed aircraft rescue missions in the open desert military training areas east of the airfields.

To support the airfield threat scenario, Task Force Redhawk identified the need for outlying urban settings from which the insurgents could recruit and operate. The task force constructed two small Iraqi villages with basic structures that included centrally located homes and businesses, a school, a police station, and a cafe. The villages were built by the OC/Ts out of pressure-treated lumber and plywood purchased by the brigade through the Fort Bliss Directorate of Public Works and Logistics. While many of the buildings were simple



Figure 2. Village of Al Mattr, main street

one- or two-room structures with a single entry, each village had some complex floor plans and a two-story mosque. Later, several old storage buildings were added that the garrison commander made available. A contract provided soil stabilization of the roads, which started out as off-road tire tracks in the Fort Bliss sand. The northern village of "Akbar-Kristalad" consisted of 41 tightly grouped structures, and the southern village of "Al Mattr" consisted of 63 structures dispersed over a wider area (see Figure 2). The sizes and geography of the two villages allowed different tactical challenges for the commander to consider, including security patrols, raids, or cordon-and-search operations. The construction of the two villages took approximately 6 weeks and cost about \$300,000.

Sand-colored paint, courtyards (formed with concrete barriers), junked cars, operational streetlights, and realistic Arabic signage on structures used by role players enhanced the basic plywood construction of the village. Key structures—a mosque, police station, town square, coffee house, and schoolhouse—were treated like the sets of a stage play. A few carefully placed items—Arabic inscriptions and prayer rugs in the mosque, a desk and a bulletin board with police patrol routes in the police chief's office, and a few desks and a map of the Middle East in the school—made these structures complete. Our contracted civilians on the battlefield spent considerable time there and were encouraged to add anything that would make the villages more real. Some of the civilians brought additional furniture, desert plants, and framed artwork, and one industrious El Paso woman made two authentic Iraqi flags! They also cooked food over open fires and played indigenous music. The addition of these features not only maintained the morale of the civilian workforce but made the task of searching rooms and buildings more difficult. Weapons caches were dug into the sand, then they were covered with a carpet and a desk. Maps, photographs, and computer disks were stashed behind pictures.

Task Force Redhawk also inherited the use of a previously constructed "terrorist training camp" that was ideally situated near the two villages (see Figure 3). This complex was surrounded by a 4x2 double-apron barbed wire fence and

included a tower, bunkers, an abandoned bus, and a mock building. The complex—dubbed "Camp Al Qacda" by the OC/Ts—replicated an insurgent staging area and was an ideal target for platoon or company raids, frequently containing a weapons cache or other intelligence indicators for the patrols to discover, search, confiscate, or destroy.

Fort Bliss Warehouse District and Railhead

The Fort Bliss warehouse district and railhead, the second major factor in the scenario for Al Wadi, replicated the northern edge of the city. Several square blocks of large storage warehouses became the local storage and distribution center for humanitarian relief supplies by various nongovernmental organizations. Operating among the legitimate organizations, the task force inserted the "Islamic Children's Relief" agency, an insurgent front whose primary purpose was smuggling weapons and explosives to support attacks on coalition main supply routes and the airfields. The training task forces therefore patrolled the warehouses, checked local (armed) Iraqi security forces posted there, and attempted to uncover evidence of insurgent infiltration and covert weapons smuggling.

From the FOB, patrols moved either east (parallel to the Biggs Army Airfield and the north) in and around two new MOUT villages, or west and then north to the Fort Bliss railhead area. The southern patrolling area encompassed portions of the Fort Bliss main post, including a warehouse district that was ideal for the operational scenario. Through coordination with the garrison, Task Force Redhawk gained access to the warehouse grounds and the interior of selected buildings to portray insurgent operations in this area, eventually leading up to raids or cordon-and-search operations at the company or task force level.

The tactical challenges of the "Al Wadi warehouse district" were the centerpiece of the training. Complex urban features included multistory buildings, deep box-culvert drainage ditches, 90-degree blind corners, loading docks, fenced compounds, streetlights, and dumpsters. Since Fort Bliss is an active military base, real-world traffic added realism to the



Figure 3. Mock terrorist training camp at Biggs Army Airfield

environment. OC/Ts ensured that traffic was unimpeded by the training operation, although the confusion and gawking from post personnel and families as they drove past the training site effectively simulated some of the same conditions found in Iraq.

Patrol routes (5 to 7 miles in length) were controlled by mandating designated checkpoints. These checkpoints, typically power or water substations, required security checks because they provided essential services to the local villages and were routinely sabotaged by insurgents to discredit coalition efforts. Units on patrol would encounter sniper fire, drive-by shootings, informants, rock-throwing crowds, and eventually firefights with armed insurgents found caching weapons inside one of the warehouses.

For the OC/Ts, the checkpoints served to keep multiple, simultaneous patrols "on time, on target" with the established master event list in order to accomplish the training objectives each night. Several squads and platoons could be on patrol at the same or nearby routes, offset only by a later start time. OC/Ts used internal communications to maintain situational awareness and patrol intervals. Squads and platoons were chosen from separate companies to minimize radio collaboration while on a patrol designed to train squad leader and platoon leader instincts.

Using this combination of varying urban terrain and the supporting threat scenario gave the task force the opportunity to interact with friendly villagers and enemy insurgents, apply rules of engagement, hone their patrolling skills, and practice the battle drills they would need to survive these situations in theater. Junior leaders quickly developed decentralized thinking since communications were challenging in their operating environment. At the same time, company command posts and task force tactical operations centers were able to refine tactics, techniques, and procedures; develop link diagrams, pattern analysis, and graduated response matrices; and track the location and status of their small units while outside the FOB wire.

Lessons Learned

Urban terrain available for training with battlefield effects is limited at most Army bases. The 2-91st TSB constructed its own and convinced post leadership to allow it to fire blanks and use pyrotechnics in what was essentially the cantonment area of Fort Bliss. The combination of the railhead, warehouses, airfields, and mock villages became a highly effective patrolling environment once occupied by interactors tied together with a realistic provincial intelligence backdrop.

Traditional Army MOUT sites can be highly effective training for some small-unit tactics, patrolling, and close-quarters combat with simulations or blanks, but full-up "shoothouses" of the type the 2-91st TSB constructed at Fort Bliss are needed to advance training squads and platoons all the way through live-fire close-combat clearing rooms and buildings. What most Army MOUT facilities lack is suitable

size; variety of interior layouts; and actual basements, sewers, streetlights, and other features that are found in a real city.

Existing or abandoned urban settings, such as multiblock warehouse districts or housing areas, are extremely effective for large-scale urban-operations training such as company- and battalion task force-sized cordon-and-search operations. A consideration for the Army in this next round of base realignments and closures might be to hold onto one or more suitable areas for this kind of training.

The Army needs an urban warfare center, on the scale of the existing combat training centers, suitable for audiences up to battalion task force level and manned by a dedicated team of observer-controllers and OPFOR who are experts in close-quarters combat and insurgent tactics. An urban operations and counterinsurgency school of thought for mid- to senior-level staff officers and commanders could also be added. In addition, an urban warfare school could be established on par with the Northern Warfare or Jungle Warfare Schools, along with potentially changing a phase of the Ranger School to accommodate an urban-center rotation.

Summary

As 75 percent of the world's population moves to urban areas within the next 10 to 20 years, urban combat will become more prevalent and will increase our Army's need to properly train for it. The province of Al Wadi developed into a highly effective urban and complex terrain training area for a task force in a BCT. The Al Wadi villages have now been relocated; however, before they were moved, elements of this scenario were used again for a second deploying BCT and several separate companies. And United States Army Training and Doctrine Command (TRADOC) and United States Army Forces Command (FORSCOM) tenant units and a number of government, joint, or international organizations also used the villages to support training on numerous occasions.

Sharpen the Edge!



Lieutenant Colonel McClellan served with the 2-91st TSB for eight months as the brigade executive officer before assuming command of the 1st Battalion, 361st Engineer Regiment, in June 2004. Previous assignments include platoon leader, company commander, and battalion S-3. He has served combat tours in Desert Shield, Desert Storm, and Operation Iraqi Freedom and has had extensive overseas experience in Europe, the Balkans, Korea, and Central America.

Captain Noe served as an observer-controller/trainer detachment commander for Bravo Company, 1st Battalion, 361st Engineer Regiment, for two years following his deployment to Iraq. Previous assignments include company commander, battalion S-1, aide-de-camp, battalion S-2, task force engineer, and platoon leader. He has served in Operation Iraqi Freedom, Joint Guardian II, Allied Force, and Able Sentry and was recently assigned to instruct tactics as the U.S. Exchange Officer to the Canadian Forces School of Military Engineering.



The Combat Corps Wheeled Battalion in the Divisional Warfight

Combat Engineering in an Urban Environment

By Lieutenant Colonel David E. Chesser and Major Adam S. Roth

Imagine a unit being transformed from Code 4 (C4) (not combat ready) to Code 1 (C1) (fully combat ready) in only 152 days and then successfully executing more than 1,400 combat engineer missions in an urban environment in the span of a one-year deployment. A unit engaged by insurgent forces more than 50 times, yet never wavering in the face of the inherent dangers of combat. A unit whose Soldiers were awarded 42 Bronze Stars, 22 Purple Hearts, and 12 Army Commendation Medals for Valor and nominated for the Meritorious Unit Citation. Sounds like Audie Murphy's unit in World War II, doesn't it? Well, it isn't. This is the story of the 458th Engineer Battalion (Corps) (Wheeled), United States Army Reserve, and how its Citizen-Soldiers provided full-spectrum engineer support to the 1st Cavalry Division in the urban environment of Baghdad, Iraq, during Operation Iraqi Freedom. The purpose of this article is to share information with the Engineer Regiment to help guide other engineer units in their preparations for conducting operations in an urban environment in support of the Global War on Terrorism.

Mission Analysis and METL

The corps wheeled engineer battalion is comprised of a headquarters and headquarters company and three line companies. Each line company is comprised of a headquarters element, three sapper platoons, and an equipment and obstacle section (commonly referred to as the support platoon). The three maintenance teams (nuclear, biological,

and chemical [NBC] specialists; communications specialists; and medics assigned to the headquarters company) were attached to the line companies during the deployment, which increased their assigned strength. This personnel structure, along with the battalion's organic equipment, was ideal for stability and reconstruction operations in an urban environment.

According to the modified table of organization and equipment (MTOE), the mission of the combat corps wheeled battalion is *"to increase the combat effectiveness of the corps by accomplishing mobility, countermobility, survivability, and sustainment engineering tasks."* Upon mobilization in November 2003, the 458th Engineer Battalion was told by the Engineer Brigade, 1st Cavalry Division, to provide direct support to the division. We only had to look at our secondary mission *"to reinforce divisional engineer units when required,"* to know that we were operating within doctrine. We were being pushed forward from the corps rear into the division fight on an asymmetric battlefield and immediately recognized the need to conduct a thorough mission analysis and revise our mission-essential task list (METL) for combat engineering in an urban environment. The revised METL proved invaluable in guiding the battalion to combat readiness in a minimum amount of time during postmobilization training.

During the home station phase of mobilization, the military decision-making process (MDMP) was used to refine the battalion's METL. The battalion's previous war trace alignment

was to another major theater of operations and was geared for high-intensity conflict. After being alerted for mobilization, the battalion's senior leadership conducted a detailed mission analysis for stability and reconstruction operations. The analysis was that the battalion would not be required to perform many doctrinal engineer missions (such as emplacing or breaching minefields or supporting river-crossing operations), but would be tasked to execute several nondoctrinal missions (such as heavy rescue and route clearance with prototypal equipment). Our refined mission statement became—

"The 458th Engineer Battalion provides mobility, countermobility, survivability, and general engineering to the 1st Cavalry Division in Multinational Division (MND)-Central Baghdad in support of stability operations and support operations in order to set the conditions for coalition forces and enable them to support the progressive transfer of authority to the Iraqi people, their institutions, and a legitimate Iraqi national government."

The battalion METL was then revised, based on the new mission statement and the doctrine of Field Manual 7-1, *Battle Focused Training*.

Training

Based on a training readiness assessment of the stability and reconstruction operations METL, the battalion commander and operations staff officer (S-3) developed

a training strategy that ensured combat readiness at the conclusion of the reception, staging, onward movement, and integration (RSOI) process. Because 52 percent of assigned personnel strength was cross-leveled into the battalion within 30 days of mobilization, the strategy initially focused on individual Soldier survivability skills.

While squad leaders and platoon sergeants were executing this training and building cohesive teams, the senior leadership was developing training plans to achieve combat readiness for stability and reconstruction operations. The unit then mapped out a plan to train the additional requirements during a 25-day period of mobilization-station training to attain (METL) proficiency for deployment. This training included multiechelon training in military operations on urbanized terrain (MOUT), basic and advanced demolitions, urban search and rescue (heavy rescue), and counter-improvised explosive device (IED) operations. Our partner throughout the training process was the 3d Battalion, 315th Regiment (Training Support) (3/315th) which assumed the role of unit assistor during the mobilization process. The 458th had previously attended annual training with the 3/315th, who helped plan and execute a training strategy.

Full-Spectrum Operations

The 458th conducted a relief-in-place/transfer of authority, initially supporting the 1st Armored Division on 27 March 2004 and then the 1st Cavalry Division



Photo by Lieutenant Colonel David E. Chesser

Combat engineers emplace prefabricated concrete barriers in support of force protection engineering operations.

30 days later. Our expectation was that stability and reconstruction operations would evolve into nation building, and we would be heavily engaged in general engineering in support of civil-military operations. We were wrong. By the middle of April, Mahdi's army declared war on coalition forces and the insurgency was in full swing. Stability and reconstruction operations turned into full-spectrum operations for the division. The 458th was directed to reorganize a platoon to fight as infantry. And the battalion's mission evolved into route clearance (becoming our bread-and-butter mission), force protection engineering, and heavy rescue and consequence management (taking on a greater sense of urgency due to the use of vehicle-borne improvised explosive devices [VBIEDs]).

Fight as Infantry

In May 2004, the 458th was tasked by the division Engineer Brigade to reorganize a platoon to fight as infantry and attach it to the 91st Engineer Battalion to help secure a sector of West Baghdad for 9 months. During that period, the platoon executed patrols, raids, cordon-and-search operations, IED clearance, and quick-reaction force missions as mounted and dismounted infantry. The Soldiers executed 450 combat patrols, engaging insurgents on multiple occasions, without a single serious injury. The ability of this platoon to rapidly reorganize and train and successfully execute infantry missions in a tough urban environment is a testament to the platoon's leadership and the rugged training that the corps wheeled battalion habitually executes in peacetime to be able to fight as infantry in wartime.

Route Clearance Operations

Probably the single most important engineering mission executed by the 458th Engineer Battalion was that of conducting counter-IED operations. Known as *Task Force Iron Claw*, the operation assured mobility within the division battlespace by finding IEDs along main and alternate supply routes and coordinating with supporting explosive ordnance teams for destruction or retrieval of the IEDs. Using prototypal equipment known as the Interim Vehicle-Mounted Mine Detection System (IVMMDS), the line platoons executed Task Force Iron Claw operations. The tactics, techniques, and procedures were continuously altered to enhance the task force's capability and survivability in an environment where 93 percent of all IEDs emplaced within Iraq were found. The primary combat system used by the task force was the mine-protected clearance vehicle (MPCV) commonly referred to as the Buffalo. The ability of the Buffalo to "interrogate" potential



Photo by Lieutenant Colonel David E. Chesser

Soldiers from Task Force Iron Claw perform route clearance operations.

IEDs with its articulating arm, while the crew remained protected inside the vehicle, made it invaluable. During 12 months of combat operations, Task Force Iron Claw completed 575 missions, clearing 171 IEDs over 34,000 kilometers of roadway. The task force's ability to locate and neutralize IEDs preserved combat power and assured mobility for coalition forces.

Insurgents were using the rural roads outside of Baghdad's population centers to ferry arms and forces from outlying weapons caches into the city. The routes they used were known as "rat lines." Soldiers of the 458th provided the brigade combat teams with no-notice barrier emplacement support for snap traffic control points on many occasions to interdict these rat lines. The battalion also participated in a more unconventional approach to interdicting the rat lines by using mine-clearing line charges (MICLICs). The end result was the denial of insurgent lateral maneuver.

Force Protection Engineering

Many of the forward operating bases (FOBs) constructed during Operation Iraqi Freedom had limited force protection due to the availability of barrier materials or engineers to complete force protection projects. The heavy equipment available to the battalion, coupled with the abundance of military occupational specialty 21B combat engineer Soldiers, made this mission a perfect fit. The battalion was continually employed in the heightening of force protection at FOBs and Iraqi facilities within the Task Force Baghdad area of responsibility. Anything from erecting precast concrete barriers around key facilities, filling HESCO® Bastions, constructing

berms around FOBs, and erecting concertina fence were all missions that the 458th Engineer Battalion performed on a daily basis. In support of force protection operations, the battalion constructed more than 19 kilometers of earthen berms and 11 kilometers of concertina fencing, emplaced 1,523 mortar bunkers and 34,071 precast concrete barriers, and filled 23,690 HESCO Bastions at 11 FOBs and numerous Iraqi government facilities to harden them against insurgent attack.

Heavy Rescue Operations

Before deploying, the 458th received the mission to provide a consequence management and heavy rescue capability as a result of weapons of mass destruction incidents within Baghdad. A heavy rescue unit was trained and equipped at the Fort McCoy Mobilization Station in Wisconsin and provided urban search and rescue and confined-space rescue on numerous occasions within the Task Force Baghdad area. (A description of this unit and its training can be found in the January-March 2005 issue of *Engineer*, page 37.)

The pinnacle achievement of the heavy rescue unit, known as *Rescue One*, was its actions in response to an anti-Iraqi forces bombing in the Ghazaliyah section of Baghdad on 29 December 2004. An Iraqi family was held hostage inside a three-story structure that was wired with 1,800 pounds of explosives. Once the Iraqi police arrived and opened the door to the residence, the blast devastated the entire neighborhood. Members of *Rescue One*, working hand-in-hand with the Iraqi first responders, saved the life of a 22-year-old Iraqi woman through a 3-hour, confined-space rescue and recovered all four of her children using confined-space rescue and heavy-equipment recovery techniques.

Support of Fallujah Offensive

In November 2004, the 458th Engineer Battalion received the mission to provide horizontal engineering support to the 2d Brigade Combat Team and the United States Marine Corps during the Fallujah Offensive. The battalion staff performed the MDMP (as it had for every mission the battalion received) and tailored a platoon-sized task force of horizontal construction assets with embedded 21B Soldiers for security. During a 2-week period, the task force constructed earthen berms around FOBs, emplaced HESCO Bastions around command and control nodes, dug in the brigade artillery battery, and constructed multiple traffic-control points.

Civic Action Projects/Humanitarian Assistance

Due to the intensity of the insurgency, the brigade combat teams frequently conducted kinetic (offensive) operations to establish control in sectors. The goal of the division commander was to eventually conduct nation-building operations. His intent was to take the AK-47s out of the hands of the insurgents and replace them with shovels, employing the insurgents in projects that would help to rebuild their nation. The negative aspect of kinetic operations was the

collateral damage that resulted, creating a need to quickly show the coalition's commitment to "making it right." The 458th Engineer Battalion's Headquarters Company was tasked to support what became known as *Operation Rhode*, and served to get the Iraqis back on their feet after kinetic operations. The headquarters company transportation section purchased, stored, and delivered "Rhode Packages" to brigade combat teams after combat operations in their sectors.

- **Sustenance packages** consisted of items for meeting basic nutritional needs (including rice, flour, and canned goods).
- **Construction packages** consisted of basic construction materials required to make repairs to damaged homes (such as lumber, nails, roofing materials, and plywood).
- **Neighborhood area council packages** consisted of items to help reestablish government at the local level (such as computers, office automation equipment, and basic office furniture).

This form of nation building provided coalition forces with a method of demonstrating commitment to the rebuilding of Iraq.

Summary

The 458th Engineer Battalion served with distinction during Operation Iraqi Freedom in the tough urban environment of Baghdad. The broad spectrum of missions the battalion accomplished reflects its adaptation of engineering doctrine to the contemporary operating environment, coupled with effective training and sound leadership. The flexibility of the corps wheeled structure, when combined with the versatility of the Army Reserve's Citizen-Soldiers, makes it an ideal organization for supporting divisional operations across the continuum of conflict.



Lieutenant Colonel Chesser is the commander of the 458th Engineer Battalion. He commanded a combat corps wheeled engineer company in Germany and has served in numerous staff and leadership positions. He is a graduate of the Command and General Staff College and the Sustaining Base Leadership Management Course.

Major Roth is the executive officer of the 458th Engineer Battalion and has commanded a combat heavy engineer company. He is a graduate of the Command and General Staff College and holds a master's in mechanical engineering from Boston University.



EFFECTING A MAJOR ROAD REPAIR IN BAGHDAD

*By Lieutenant Colonel Keith A. Landry,
Major Glen T. Adams, and Captain Steven M.
Brown*



Just days after completing a relief-in-place/transfer of authority with its predecessor, Task Force Black Diamonds deployed engineer assets off a secure base camp for the first time in support of Multinational Division-Baghdad. The task force was formed around the 92d Engineer Battalion (Combat) (Heavy) as part of the 36th Engineer Group (Combat). The task force consists of a headquarters and support company, two combat heavy engineer line companies, a United States Army Reserve combat heavy engineer line company, a chemical company, and an Army National Guard utilities detachment. The mission was to repair three road craters on a corps main supply route. Using some form of improvised explosives placed deep inside existing culverts, anti-Iraqi forces had created the craters along a three-lane road, which closed the westbound lanes to civilian traffic.

Engineer Reconnaissance

An engineer reconnaissance revealed that the craters averaged more than 40 feet in diameter and 8 feet in depth. Key leaders gathered to disseminate the results of the reconnaissance and receive the battalion commander's initial guidance before developing courses of action. The intelligence staff officer's (S-2's) engineer preparation of the battlefield revealed a pattern of anti-Iraqi force activity in the area where engineers would be traveling and working. Terrain analysis at all three crater locations showed that an eastbound

three-lane road, set apart by a 10-meter-wide dirt median, paralleled the three westbound lanes. Because the westbound lanes were closed, there was significant civilian traffic on the eastbound lanes in both directions except during nightly curfews. At times, civilian vehicles also traveled on a one-lane dirt road that paralleled the damaged road to the north. An extended area of one- to three-story buildings flanked the eastbound lanes. The area to the west of the craters was an open field, dominated by a high earthen berm near the road. The security plan would have to address these concerns while on-site as well as while moving to and from the crater locations.

Course of Action

Photographs and measurements of each crater were used to develop a course of action. Labeling the craters from west to east, Crater A was 1.5 kilometers west of Craters B and C, which were just 50 meters apart. Concept sketches were developed to repair all three craters simultaneously or in groups. The battalion commander's guidance was to repair Crater A first, then repair Craters B and C simultaneously. This would potentially increase the total time spent on-site, but by using maneuver and aviation assets for security, the risk would be mitigated and the engineer footprint would be relatively small. The engineer assets task-organized for the mission included elements from the Reserve line company's horizontal construction platoon and one of its vertical construction

platoons, along with haul assets from the headquarters and support company's heavy equipment platoon.

Crater A

Final refinement of the plan further delineated each crater repair into three distinct phases:

- **Phase I** consisted of mobilizing and deploying horizontal engineer assets to clear blast debris from the crater and repair the road base (see photo on page 15). Required equipment included a vibratory roller, a front-end loader, a hydraulic excavator (HYEX), a bulldozer, a Bobcat®, two M916 tractors with M870 trailers carrying Texas "T" concrete barriers (which served as vehicle-borne improvised explosive device [VBIED] blast shields), and five 20-ton dump trucks. Two of the trucks were loaded with fill, while the remaining trucks carried crushed limestone. To minimize the fill required to repair the subbase, blast debris from the craters was used for backfill. Clean fill was deposited on top of the blast debris in layers and compacted. An 8-inch lift of crushed limestone was used as the base for the 10-inch-thick reinforced concrete wearing surface.
- **Phase II** began once the roller started to compact the layer of limestone. Engineers from the vertical construction section prepared the required formwork and placed the reinforcing steel. The section consisted of a squad, a trailer-mounted 250-cubic-feet-per-minute (CFM) air compressor, a 5-ton dump truck, and several masonry kits. The dump truck's bed was raised and used to drop the prefabricated forms and rebar mats onto the road surface. The forms were used where the crater had breached the road shoulder.

The bars of the rebar mats were tack-welded to reduce fabrication time, allow rougher handling in transit, and increase the speed of emplacement.

- **Phase III** consisted of the actual concrete placement. A local contractor provided the concrete for the pour. The vertical section Soldiers were the only ones on the ground to work the concrete into the form, and the engineer Soldiers provided local security. For Crater A, Phases I and II took place on Day 1 of the mission. Phase III, which required five truckloads of concrete (approximately 40 cubic yards), took place on Day 2. Since five concrete trucks were never available at one time, engineer Soldiers had to wait while the trucks returned to the batch plant to be reloaded. Turnaround times for this mission ranged from 45 minutes to 3 hours depending on traffic, route conditions, and camp gate access. Using a concrete additive decreased its curing time, allowing the crater repairs to be completed and the road available for traffic much sooner.

Craters B and C

Plans for repairing Craters B and C were refined using lessons learned while repairing Crater A. During initial movement to the location of Craters B and C, the engineer lieutenant in charge staged a heavy, expanded-mobility tactical truck (HEMTT) wrecker, the 20-ton dump trucks, and the vertical section's equipment in preparation for Phases II and III on Craters B and C. Engineer assets would be called forward from the rally point as required to minimize the size of the engineer footprint on-site. During the military decision-making process (MDMP), it was difficult to determine how much usable fill material was in each crater. By using the asphalt and



A local contractor provided the concrete that Task Force Black Diamonds placed to repair Crater B.

A Task Force Black Diamonds Soldier uses a float to finish the repair of a crater after the vibrating and screeding process.



blast debris from Crater A to repair the subbase—and removing the large, unwieldy pieces—the horizontal construction section only had to bring in fill equal to roughly 25 percent of the crater volume. Craters B and C were so close to each other that the engineers determined that the horizontal section could start Phase I on Crater C while the vertical section executed Phase II on Crater B without increasing the number of 20-ton dump trucks required. On Days 3, 4, and 5, engineers hauled and placed one 20-ton load of blast debris taken from Crater A, two loads of fill, and four loads of crushed limestone per day. On Day 4, they placed 40 yards of concrete and repaired Crater B. On Day 5, they placed 64 yards of concrete and repaired Crater C.

Lessons Learned

There are several key lessons learned from this repair mission:

- Troop-leading procedures and the MDMP are vital to the preparation of executable plans and must be fully understood at all levels of command.
- Engineers must proactively develop a security plan that integrates maneuver units with engineers in an urban environment to take advantage of the maneuver units' ability to observe larger areas at greater distances than the engineers.
- Planning rally points near project sites allows equipment to be staged off-site and reduces the number of vehicles exposed to anti-Iraqi force attacks.
- Prefabrication of rebar mats and forms limits the time Soldiers are exposed on-site.
- Control measures during the MDMP must be incorporated into the security plan to mitigate the stress on site security caused by civilians on the battlefield.

Conclusion

During the repair of the three road craters, Task Force Black Diamonds placed 144 cubic yards of concrete over a five-day period. The concrete was given three days to cure before the route was reopened to military and civilian traffic. It has remained open ever since without needing repairs, despite being struck by additional mortar rounds. The task force continues to provide construction engineering and chemical force protection to Iraqi army, Iraqi police, and U.S. Army units within the supported area of responsibility in both complex urban terrain and more rural locations.

Black Diamonds—With Pride!

For additional information, or to get a copy of this article that discusses in more detail the specific tactics, techniques, and procedures used by the task force, contact the battalion via Secret Internet Protocol Router Network (SIPRNET) or contact [<James.L.Moore@us.army.smil.mil>](mailto:James.L.Moore@us.army.smil.mil).



Lieutenant Colonel Landry is the commander of the 92d Engineer Battalion (Combat) (Heavy). He holds a doctorate in civil engineering from Rensselaer Polytechnic Institute, Troy, New York, and is a professional engineer in Virginia.

Major Adams is the battalion operations officer of the 92d Engineer Battalion (Combat) (Heavy). He holds a degree in general studies and psychology from Washington State University, Pullman, Washington.

Captain Brown is the commander of Charlie Company, 365th Engineer Battalion (Combat) (Heavy). He holds a bachelor's in agricultural and biological engineering from Pennsylvania State University, University Park, Pennsylvania, and is currently working on a master's in environmental engineering at his alma mater.



CTC Notes



National Training Center (NTC)

SWEAT

By Lieutenant Colonel Thomas H. Magness and Major James Ahearn

The status of infrastructure, and the ability to show improvement, is critical to the success of the mission in Iraq and Afghanistan. NTC is addressing this issue by preparing units to assess infrastructural deficiencies and develop plans to remedy critical shortfalls. By aggressively seeking to determine the current state of infrastructure through assessment and interaction with local leaders—and then using all available assets to design and implement solutions—units will be successful in achieving their intended effects and reaching overall strategic goals.

SWEAT Assessment

Although there are variations among units, NTC defines “SWEAT” as the status of sewage, water, electricity, academics,

and trash. The SWEAT assessment simply provides a format for assessing these conditions. During reception, staging, onward movement, and integration (RSOI), rotational units are given the task of performing an assessment of actual facilities on Fort Irwin, such as the sewage treatment facility and the electrical distribution system. As the rotation progresses, units should continue this process by conducting an assessment of each town in the area of operations.

Many Soldiers are daunted by the task of performing an evaluation of something such as a power plant, but there are tools available to help. One such product is the SWEAT Smart Book, a tool produced by the Sidewinder team in collaboration with the United States Military Academy faculty, the United States Army Engineer School, and the United States Army Corps of Engineers® (USACE). The Smart Book is an easy-to-use guide that identifies the basics of facility operations and provides checklists of information required for further analysis. The SWEAT Smart Book and other associated infrastructure assessment tools are available for distribution through the Sidewinder Team at NTC or online at the Sidewinder home page <<http://www.irwin.army.mil/Units/Operations+Group/Sidewinder>>. (Select “Resources” from the menu.)

In addition to assessments conducted by the unit, a great deal of information is available through local leaders and public officials. This information is also helpful because it indicates the most pressing needs as seen by those who are the end users of each system. By addressing critical needs first, coalition forces are able to demonstrate their resolve to improve the living conditions of the average citizen. Doing so eventually robs the insurgency of its legitimacy. Training units are able to conduct assessments, develop plans and specifications, and project scopes of work and initiate contracting measures for proposed infrastructure projects.

Professional Assistance

NTC and USACE have recently teamed up to provide even more realistic training by deploying a Forward Engineer Support Team (FEST) during rotations. This team, comprised of USACE military and civilian personnel, works in support of the brigade. The team’s professional background provides the ability to produce comprehensive design work, to include identification of resources required for each project. In addition, the FEST brings with it a Tele-Engineering Kit, which enables the team to simultaneously interact with research and design facilities worldwide, bringing the full weight of USACE to the fight.

A recent addition to the NTC rotation is Soldiers from the engineer prime power battalion. Working in conjunction with the FEST, the battalion is trained and ready to enable the brigade combat team (BCT) to assess and improve electrical infrastructure in the forward operating bases (FOBs) and the supported town populations.



A USACE FEST conducts an assessment in Medina Wasl, a mock Iraqi training village at NTC.

Project Management

BCTs are often challenged to fully leverage the engineer capabilities within their ranks and to make any meaningful progress with regard to infrastructure and project delivery during a 14-day rotation. While the BCT includes a variety of units with the requisite skills and tools (SWEAT Smart Books, FESTs, and prime power members; trained combat and construction engineers; and civil affairs specialists), they are generally best served by a dedicated organization with the leadership and staff support to meet the monumental tasks associated with reconstruction.

As trainers for the special troops battalions (STBs)—or brigade troops battalions (BTBs) in our current doctrine—within the BCT, the Sidewinders continue to take observations from the theater and apply them to the training scenario and with NTC rotational units. Currently, deployed BTBs often have the lead role for reconstruction within their supported BCTs, leveraging the capabilities of its staff and leaders for what is among the top operational priorities for our forces. Deployed units have determined the magnitude of a reconstruction program with hundreds of individual projects valued in the tens or hundreds of millions of dollars. Requirements for work inspections, pay agent duties, and military and civilian liaison responsibilities across the brigade's area of responsibility are worthy of focused (command) oversight. As the doctrinal command and control node for attached units such as FESTs, prime power, civil affairs, and engineers, STBs/BTBs are often in the best position to build and lead the team to address the infrastructure needs, in coordination with the Iraqi government leadership. The

Sidewinders have developed a suite of tools to assist those units that are assigned the reconstruction/project management mission, to include staff products and project management tools.

Summary

As units aggressively seek to employ all available skills and tools in the collection and analysis of relevant information—and then develop coherent, achievable goals—they find themselves postured for success in the battle for the hearts and minds of the local population. By showing tangible progress in the daily life of average citizens through steady, meaningful improvements to critical infrastructure, coalition forces will earn their trust and respect, denying the enemy the same. This is just as important to success at NTC as it is in Iraq and Afghanistan.

Lieutenant Colonel Magness is the Senior Maneuver Support Trainer, Sidewinder 07, at the National Training Center, Fort Irwin, California. He previously served as the District Commander for the Detroit District, United States Army Corps of Engineers. He is a graduate of the United States Military Academy and holds a master's in civil engineering from the University of Texas.

Major Ahearn was the Assistant Brigade Engineer Trainer, Sidewinder 03B, from 2000 to 2005. He was recently selected for the civil affairs branch and began his new functional area training at Fort Bragg, North Carolina, in June 2005. He received his commission through Officer Candidate School at Fort Benning, Georgia.

THE ARMY'S TOP FIREFIGHTER

By Ms. Cheryl Green

Sergeant First Class (SFC) Wayne J. Reinhardt was recently chosen as the Military Fire Officer of the Year by the Department of the Army. SFC Reinhardt, recognized for his dedication to mission accomplishment, was nominated by his supervisor. He first won the Northwest Region Military Fire Officer title, then was nominated for and won the Army Military Fire Officer title, and finally was nominated for the Department of Defense Military Fire Officer of the Year award.

SFC Reinhardt was officially presented the Northwest Region Military Fire Officer of the Year award at the Department of Defense Fire and Emergency Services Training Conference held from 11-16 August 2005.

As a senior training developer and writer for the Army's firefighters at the United States Army Engineer School, Fort Leonard Wood, Missouri, SFC Reinhardt ensures that all firefighting equipment and training manuals are first-rate for Army firefighters. He has managed and developed multiple training products to support the Army's training efforts for both individual firefighters and firefighting units, to include producing two manuals six months ahead of schedule without compromising quality. He serves as the voice for Active Army military firefighters, bringing current firefighting issues to the International Association of Fire Chiefs working group sessions. Selected to review new equipment training for future firefighters on the newly developed Tactical Fire Fighting Truck (TFFT) and verify the training materials, SFC Reinhardt provided significant input during this process.

SFC Reinhardt was recognized for many outstanding achievements in several of the positions he has held, including United States Army Engineer School Liaison for all Active Army, United States Army Reserve, and Army



Photo by Cheryl Green

Sergeant First Class Wayne J. Reinhardt, Army Military Fire Officer of the Year

National Guard firefighters; shift supervisor at the Louis F. Garland Fire Academy, Goodfellow Air Force Base, Texas; Active Duty Unit Advisor to 15 Ohio Army National Guard and Reserve units activated during Operation Iraqi Freedom; Chief Fire Inspector at Camp Doha, Kuwait; and Senior Firefighter on the Flatiron Air Ambulance teams at Fort Rucker, Alabama.

SFC Reinhardt has served more than 18 years as an Army firefighter and has volunteered at local fire departments. He currently volunteers at the Duke Fire Protection District, where he trains local volunteer fire district members to National Fire Protection Association (NFPA) and Missouri standards. In addition, he volunteered as a firefighter for five years at the Barker Volunteer Fire Department, Barker, New York.

SFC Reinhardt has also volunteered for the *Christmas in April* program in

San Angelo, Texas, and has rebuilt and repaired homes for the *Habitat for Humanity* program, where he helped organize two teams to repair two homes in two days.

SFC Reinhardt is a certified Master Army Instructor and Master Air Force Instructor, who has shared valuable knowledge with his students over the years. He is a highly skilled and competent fire officer who continuously pursues knowledge in the firefighting field. 

Ms. Green is a contributing editor for Engineer. She also edits training and doctrine publications for the Directorate of Training and Leader Development, United States Army Engineer School, Fort Leonard Wood, Missouri. She holds a bachelor's in computer information systems from Northwestern State University, Natchitoches, Louisiana.



NEW TACTICAL FIRE FIGHTING TRUCK

By Specialist Judith D. DaCosta

Representatives from Pierce® Manufacturing, Incorporated, and the Department of the Army, including the Commanding General of the 89th Regional Readiness Command, presented the 406th Engineer Fire Fighting Detachment with a new M1142 Tactical Fire Fighting Truck (TFFT) on 29 January 2005, at the Army Reserve Center in Salina, Kansas. The TFFT is engineered like no other vehicle in use by the military today. It combines the superior mobility of the Army heavy expanded-mobility tactical truck (HEMTT) with the advanced firefighting capabilities of Pierce fire apparatus. The result is a multifunctional vehicle that is ready to deploy in almost any terrain and combat five types of fires/hazards: wildland; structural (limited to two stories or less); petroleum, oils, and lubricants (POL) and hazardous materials (HAZMAT); tactical vehicle; and aircraft crashes.¹



The M1142 Tactical Fire Fighting Truck in action

The development of the TFFT adds another dimension to what Pierce offers to the fire service and the U.S. military. Pierce technology demonstrates how this firefighting apparatus can help first responders in domestic communities as well as worldwide. Many Reservists are full-time civilian firefighters who use Pierce equipment in their hometown fire departments and—now—on deployment. This is a unique feature that no other company can say about its equipment.

The new TFFT, which was on display during the presentation, was referred to as a product of dedication and of great benefit to the military. More than 7,000 employees of Pierce Manufacturing and Oshkosh® Truck Corporation have taken great care and pride in providing Reservists with the finest firefighting truck in the world.

In addition to the presentation of the new TFFT, the ceremony highlighted the achievements of the 323d Engineer Fire Fighting Detachment, whose members were recognized in November 2004 for rescuing injured Soldiers from a downed Chinook helicopter in Al Fallujah, Iraq. The 323d unit members were also recognized for the completion of a week-long TFFT training course.



Specialist DaCosta is the unit administrator of the 203d Mobile Public Affairs Detachment. She has completed the journalism course at the Defense Information School in Maryland and is majoring in English at Wichita State University.

Endnote

¹ Major Mollie Pearson and Mr. Mike Bonomolo, "The Future Army Tactical Fire Fighting Truck," *Engineer*, January-March 2005, pp 59-61.



A HORSE OF A DIFFERENT COLOR

THE MANEUVER ENHANCEMENT BRIGADE

By Colonel Christopher J. Toomey

As our Army becomes a more modular force, it will no longer be tied to a divisional structure and can assemble a force based on the situation. Indeed, it is clear that the Army is moving rapidly to transform the existing divisional brigade combat teams (BCTs) into the new structures and creating new ones such as the "4th BCT" in several divisions. The current main effort is on developing units of action (UAs)—heavy, infantry, and Stryker BCTs that are stand-alone organizations purportedly tailored to the way they fight—with a nod toward the flexible two- and three-star-level units of employment (UEX) that will serve as the primary warfighting headquarters.

Across the rest of the Army, elements are also transforming to support this more modular approach by creating support brigades that are essential to the success of the force. What was formerly their division or corps predecessors are rapidly becoming sustainment brigades (division support commands/corps support groups), fire brigades (division/corps artillery brigades) or aviation brigades (division/corps aviation brigades). These support brigades—though more flexible and modernized and equipped with more robust command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR)—are in character the same as their ancestor units.

There is one support UA, however, that is truly groundbreaking. It not only has no formal antecedent—it really is a horse of a different color—but it looks

to bring to the forefront the application of freedom of action and force protection as disciplines that not only have a unique jurisdiction demanding a unique expertise but clearly recognize the evolving nature of warfare as we move from an Army based on a linear model to one adept at working in a nonlinear, noncontiguous environment that also includes the simultaneous conduct of decisive, stability, and support operations. The maneuver enhancement brigade (MEB)—currently being developed in concept by the United States Army Maneuver Support Center, Fort Leonard Wood, Missouri, and on the ground at Fort Lewis, Washington with the provisional 555th Maneuver Enhancement Brigade (formerly the 555th Combat Engineer Group)—will provide the UEX, joint force, or multinational commander with a tailored, flexible, versatile force that is adept at fusing the elements of freedom of action and force protection, thus minimizing seams arising through stove pipe approaches and providing a linkage to the emerging Protection Joint Functional Concept. Additionally, it can fill a role as a force provider for nuclear, biological, and chemical (NBC); air defense; military police; and engineer assets, as well as a rear area command when properly augmented.

Characteristics

The MEB is a *tailored, combined arms force*. Aside from its headquarters element and the organic communications and logistics

elements that form the basis for commanding, controlling, and supporting the brigade, the MEB is a mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC)—dependent organization. It leverages emerging modular principles and the "plug-and-play" nature of developing forces to apply the right force for the mission. Typically, but not exclusively, the MEB is composed of engineer, military police, chemical, air defense, civil affairs, and other units that routinely function together during protection, stability, and support operations. As necessary, the situation may dictate the assignment of maneuver or other types of units to the MEB. These forces may or may not be part of the MEB at home station, but will be assigned as necessary. For example, at Fort Lewis, the 555th includes a chemical decontamination battalion, a corps wheeled combat engineer battalion, and a combat heavy engineer battalion, as well as potentially some other units, to include an air defense artillery battalion. This presents some challenges since the cohesiveness found in the more fixed BCT organizations is not currently inherent in the MEB; the MEB will need to develop the procedures to rapidly and effectively integrate units from across all Army components.

The MEB is a *networked force*. Expected to operate over long distances and throughout an expanded battlespace, the MEB will have robust C4ISR in order to ensure seamless horizontal

and vertical integration and full situational understanding.

The MEB is *joint* in nature. The MEB fills a void that is not unique to Army forces and represents an exclusive joint capability that is not found among the other services that are oriented along more functional lines. Clearly, the MEB can operate within a joint task force and is ideal in the event of stability and support operations.

Forming the Provisional MEB

The 555th and Fort Lewis were a logical choice for the initial MEB. Clearly, Fort Lewis is an installation that is developing a culture of transformation. With two Stryker BCTs already formed and the Stryker-based 2d Cavalry Regiment in transition, the community at Fort Lewis is emerging as a place with well-defined business practices to manage change. This includes exigent facilities such as the Mission Support Training Facility, a great resource for training and supporting staffs and units. Recently redeployed from Operation Iraqi Freedom, the 555th task organization represented a mix of engineer and chemical units that was inherently geared toward maneuver enhancement. Indeed, while operating with the 4th Infantry Division during Operation Iraqi Freedom, the 555th provided maneuver support and force protection for the division and operated along many of the same lines expected of an MEB. Additionally, the great diversity of echelon-above-division units at Fort Lewis provided a pool of units to draw from in developing the MEB.

Granted provisional status in October 2004, the 555th is evolving its missions and mission-essential task list (METL) to reflect expected battlefield tasks and has embarked on a rigorous training program to develop its expertise in command and control to provide freedom of action and force protection. All along, the unit is staying linked with the United States Army Training and Doctrine Command (TRADOC) proponent—the Maneuver Support Center—to provide feedback and lessons learned.

Additionally, the 555th is fully cognizant that its subordinate units may be individually committed to current operations. This is validated since one of its battalions is already deployed to Afghanistan. Currently, the 555th consists of a diverse mix of engineer and chemical forces and is expecting the assignment of air defense artillery units as they relocate to Fort Lewis.

To focus its efforts, the 555th is concentrating on providing freedom of action through line-of-communication clearance and security, construction and maintenance, and movement control. In the area of force protection, it is examining securing critical facilities and infrastructure, NBC defense and mitigation, and command and control for internment facilities. Additionally, it is exploring the MEB's role in civil-military operations, as well as limited offensive and defensive operations. Working through a series of exercises virtually supported at Fort Lewis, the 555th is gaining insight into the desired composition of the end-state MEB, while learning how to operate as an MEB with the forces in hand.

The MEB concept was recently explored during Exercise Eagle Talon, a command post exercise held at Fort Campbell, Kentucky. The 555th served as an MEB as part of a UEx operating with various UAs. Charged with command and control of force protection across the UEx and area of operation-wide freedom of action, the MEB demonstrated that it could control a wide variety of forces as it provided the required level of freedom of action and force protection across the area of operation.

Additional Challenges

In managing any change, there are challenges that require attention. The continued development of the MEB as an effective force is no different. The MEB concept has a harmonizing effect across multiple branches. Yet, it goes against a tradition of having pure functional brigades—such as engineer, military police, chemical, and air defense artillery—that typically maintained

resident expertise at the corps and division levels. The MEB does not take the place of the functional brigades nor their expertise that is applied at the broader units of employment-operational (UEy) level and can be applied at the UEx level if the situation dictates. All branches that are prime candidates for inclusion in the MEB need to look at how they can best evolve their forces to work as part of the MEB.

Another challenge is developing leadership. The MEB will require leaders who are broad-based and can operate across heretofore branch-specific functional lines. Developing these leaders from typically stove-piped career paths is a challenge that must be addressed as the MEB concept progresses. No single functional branch has supremacy; rather, it is essential that the best leaders be selected for key assignments.

Toward the Future

The development and establishment of MEBs will provide commanders with a versatile combat force that can be tailored to a wide spectrum of operations. Ideally suited to meet requirements in the contemporary operating environment, the MEB is a key supporting UA that will enhance the ability of both maneuver BCTs and the other support brigades and ensure that our Army is successful in current and future operations. 

Colonel Toomey commanded the 555th Combat Engineer Group and 555th Maneuver Enhancement Brigade (Provisional) from 2003 to 2005. He currently commands the Afghanistan Engineer District in Kabul.

Attention Units!

Many post offices will not deliver mail without a street address. Please contact us to update your mailing address if the one we are using for you does not include a street address. Include the old address and your telephone number, as well as the corrected address, and e-mail to <engineer@wood.army.mil>.



THE 861ST ENGINEER COMPANY PREPARES FOR DEPLOYMENT

By Sergeant John Cervone

Early this year, Soldiers of the Army National Guard's 861st Engineer Company trained at Camp Shelby, in Mississippi, for their company's deployment to Iraq. The unit's mission there would be new and dangerous. These engineers are normally heavy-equipment operators and mechanics and are trained to build bridges and airfields, maintain sewer and water systems, and restore electricity. But in Iraq, many military operations require combat engineers. They find explosive devices and remove and safely detonate them as part of an effort to clear roadways. In addition, they impede enemy movement by using explosives to create obstacles.

The training the Soldiers received included clearing terrain obstacles, opening routes for armored fighting vehicles, and clearing minefields. Due to the explosive hazards facing our troops in Southwest Asia, extensive training was given on safely disposing of unexploded ordnance (UXO) and detonating booby traps. Defense against nuclear, biological,

and chemical (NBC) weapon threats was also included in the training schedule. To make the training at Camp Shelby as realistic as possible, simulated Iraqi villages were carved into the lush fields in a section of the training site. Trained role players acted as villagers, milling about and speaking Arabic. Adding to the sense of reality, the women covered their heads with scarves while some men toted AK-47s.

For additional training, the entire unit went to the National Training Center (NTC) at Fort Irwin, California, to prepare for its upcoming mission in Iraq. NTC is the only instrumented training facility in the world that is suitable for force-on-force and live-fire training. This training helped ensure that Soldiers were adequately prepared to deploy into a combat theater. The training received simulated the tempo, range, and intensity of current and future conflicts. The depth and width of the battlespace gave the 861st the unique opportunity to exercise all of its elements in a realistic environment. The unit's training included the requirement to communicate over extended

distances, exercise casualty evacuation, and navigate in difficult terrain with few distinguishable roads. Other environmental conditions, such as a daily temperature range of 40 to 50 degrees, winds over 45 knots, and constant exposure to the sun helped prepare the Soldiers of the 861st for what to expect upon arriving in Iraq.

The training at Camp Shelby helped the 861st Engineer Company unit go from working behind the lines to the front lines, clearing the way for the rest. And the training at NTC stressed every system and each Soldier to their limit, allowing the Soldiers to assess their endurance level and how prepared they were—physically and mentally—to go into combat.

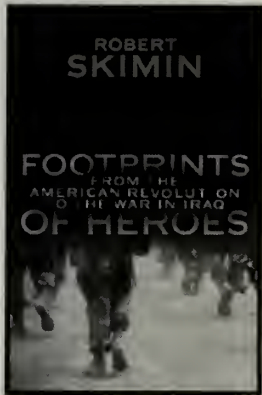


Soldiers of the 861st Engineer Company train to locate and destroy landmines and other explosive devices.

Sergeant Cervone is a public affairs specialist with the Rhode Island National Guard.

Book Review

By Mrs. Susan Groth



Footprints of Heroes: From the American Revolution to the War in Iraq by Robert Skimin. Prometheus Books, Amherst, New York, 2005, 328 pages, ISBN 1-59102-281-9, list \$26 (hardcover).

"The word hero became practically a dirty word during and after the Vietnam conflict. The same was true for patriotism. Together the words were castigated and nearly

*removed from popular lexicon. Athletes and rock stars were presented as heroes, even if the most heroic act they ever performed was staying out of jail, maligning the true meaning of the word for our young."*¹

We live in a society that is inundated by the media and popular culture and—as a result—influence our personal, political, religious, and ethical beliefs. As Robert Skimin asserts in the above quote from his book *Footprints of Heroes: From the American Revolution to the War in Iraq*, they have also influenced society's image of the hero. Too often, the word *hero* comes with an image of cultural idols. For many of our youth, heroes are measured by the number of albums sold or the number of sports records broken, not by the true measures of heroism—courage, honor, pride, responsibility, and most importantly, self-sacrifice. It took an infamous act—11 September 2001—to remind America that freedom is a gift that must be earned and appreciated, and with this reminder the image of the hero resurged. We were reminded that those who sacrifice themselves for our freedom every day, and who too often are forgotten or taken for granted, are the true heroes of our society—our firefighters, our policemen, and of course, our military heroes.

In his book, Skimin takes a unique look at military heroes throughout history, many of whom are unknown to most people. Through anecdotes and vignettes, Skimin tells the stories of the heroic acts of these military men and women. Skimin revisits the lives of our well-known heroes, such as George Washington, Ulysses S. Grant, Theodore Roosevelt, George S. Patton, Douglas MacArthur, Audie Murphy, and John McCain, just to name a few. And while it is important to know and be reminded of their accomplishments, the stories that stand out and overpower this book are the stories of the men and women whose names are not remembered or recognized for their heroic acts, such as the average Soldier of the Revolutionary War, the farmer who put aside his responsibilities at home to take up arms for freedom, the

drummer boys who beat cadence and orders in the Union Army, and the nurses who worked on the battlefields. Even Bob Hope, who brought laughter to American troops through every conflict from World War II to Desert Storm, is paid tribute to in this book. Throughout military history, there have been thousands of unknown heroes who put aside their personal needs in order to provide us with the freedom that we enjoy today—people without whom our well-known heroes and leaders would not be known. For in the words of General Norman Schwarzkopf, "It doesn't take a hero to order men into battle. It takes a hero to be one of those men who goes into battle."²

And who could forget our engineer heroes. The paths cleared by the Army engineers throughout history brought victory and made heroes out of average men and women. Engineers have played an integral part in the fight for freedom. Engineers like those who took a struggling South Vietnam and constructed the ports of Cam Ranh Bay, Nha Trang, Qui Nhon, Vung Tau, and Vung Ro. Engineers who constructed millions of storage facilities, miles of roads, millions of square yards of airfields and heliports, and numerous base camps during conflicts. And certainly Skimin did not neglect to pay tribute to Sergeant First Class Paul R. Smith of Bravo Company, 11th Engineer Battalion, whose actions killed 20 to 50 enemy soldiers, allowing our wounded Soldiers to be evacuated and saving surrounding elements and possibly 100 American lives. His heroic actions were recognized on 4 April 2005, when he became the first service person in Operation Iraqi Freedom to be awarded the Medal of Honor—*Lead the Way*.

If there ever was any question as to what defines a hero, *Footprints of Heroes* answers that question. Skimin—a former paratrooper, Army aviator, and artillery officer—presents American military history through the lives of its heroes. Although his story does not overlook the famous, it is mostly about the ambiguous, unknown fighting men and women of yesterday and today. It is a tribute to those who sacrificed for us, and it serves as a source of inspiration for us and for future generations of heroes.

Endnotes

¹Robert Skimin. *Footprints of Heroes: From the American Revolution to the War in Iraq*. Prometheus Books, 2005.

²H. Norman Schwarzkopf, Peter Petre, editor. *It Doesn't Take a Hero: The Autobiography of General H. Norman Schwarzkopf*. Bantam, 1993.

Mrs. Groth is an instructional design specialist Department of the Army intern, working with the Directorate of Common Leader Training, United States Army Maneuver Support Center, Fort Leonard Wood, Missouri. A former contributing editor for *Engineer*, she holds a bachelor's and master's in English from Cameron University and is currently working on a master's in learning systems design and development from the University of Missouri-Columbia.



A Bridge Recovery Mission in Iraq

By Sergeant First Class Pete Quinton and Second Lieutenant Maureen Wells

The 1438th Engineer Company (Multirole Bridge), Missouri Army National Guard, recently was tasked to recover (delaunch) a Mabey-Johnson Compact 200 Bridge System spanning a canal on an alternate supply route in Iraq. This was the unit's first recovery mission of this magnitude. The 1438th was introduced to this bridge system while on mobilization training at Fort Leonard Wood, Missouri, and gained additional technical training from members of the Marine company it replaced in Iraq.

The recovery mission was based entirely on the unit's knowledge of construction. Army National Guard Soldiers are unique in that they possess civilian skills and expertise in a myriad of fields. The applicability of these skills has played an integral role in the success of this unit. The crew chiefs were instrumental in the evolving technical development of the recovery plan, along with the other senior leadership, who led the unit's technical development by analyzing construction methods to accomplish the recovery successfully.

Effective tool designs and skills in machining and welding proved to be the

most valuable assets in the endeavor. The unit developed a push-pull bar assembly that attaches to the transom of the tail bay and connects to a piece of heavy equipment—an excavator, a dozer, or a common bridge transporter—which is used to push or pull steel over a gap. The members of the support platoon not only provide heavy equipment and maintenance support but also welding and machinist skills while on-site. These

are all essential skills to any bridge mission.

As the unit arrived on-site, its first task was to establish force protection. Simultaneously, the noncommissioned officer in charge (NCOIC) and platoon sergeant began directing and staging equipment and assigning details in order to occupy the area of operation. The work began immediately with teams preparing for 24-hour operations.



Photo by Sergeant First Class Pete Quinton

A soldier from the 1438th Engineer Company cuts stubborn bolts with a cutting torch.



Photo by Sergeant First Class Pete Quinton

After successfully pulling the bridge across the canal, it is now ready to dismantle and load.

Members performed earthwork and prepared to dismantle the bridge—removing deck bolts, staging cribbing and rollers, placing jacks to lift the bridge off its bearings, and preparing construction of the launching nose. The entire mission was accomplished in less than 72 hours.

The bridge crews worked long shifts, and the work was very physically demanding. Teamwork, unity, and a common objective were essential in a mission of this magnitude. But successfully accomplishing the mission instilled a sense of pride, which is the essence of this bridge unit.



Sergeant First Class Quinton is assigned to the 194th Engineer Brigade Public Affairs Office.

Second Lieutenant Wells, the leader of 2d Platoon, 1438th Engineer Company, was in charge of the bridge recovery mission, which was performed from 7-14 March 2005.



Soldiers stack decking from the dismantled bridge on a truck.





UNIT OF ACTION

RECONNAISSANCE SERGEANT

By Staff Sergeant Andrew J. Way

My assignment as a reconnaissance sergeant to the 10th Mountain Division is the first time the unit has had a combat engineer assigned organically to the staff as part of the S-3 section. Because of this, I have been given the freedom to write and define my own job and have set the groundwork for future combat engineers to step in and fill the reconnaissance sergeant position. This article is an overview of my duties and responsibilities and the lessons I have learned while assigned to this position.

Since I am organic to the battalion, the staff has relied on me to plan their engineer support operations. This makes it very convenient for the S-3 and assistant S-3 to get answers quickly and to better include engineers in the scheme of maneuver. Previously, the platoon leader, acting as the task force engineer, was the main component for answering the task force's questions and assisting in planning. In this sense, I've become the deputy task force engineer. A primary concern I have had with this is that the infantry does not prioritize tasks the same as engineers. My unit, the 87th Infantry Battalion, is very responsive to my input concerning engineer system incorporation and operational needs. This must be communicated in a clear and concise manner, which is something that we as staff engineers need to master. It is important that competent staff sergeants are placed in this position in order for the infantry to develop a positive attitude toward engineers as a force multiplier.

During the military decision-making process (MDMP), my primary job is to assist the S-2 in his analysis. In addition, depending on the availability of the task force engineer, terrain analysis is one of my areas of responsibility. I also assist with or write the Engineer Annex to the operations order.

During operations, I'm responsible for tracking route status, improvised explosive devices (IEDs) found or detonated, engineer assets on the battlefield, implementation of engineer assets, force protection, and reverse Battlefield Operating Systems (BOSs). Another area that leads to success is knowing things that the average combat engineer might not be familiar with. These include the rise and fall of low-water crossings,

the amount of power required to run a forward operating base (FOB) or a local village, the amount of spoil required to fill HESCO® Bastions, and the number of HESCO Bastions required to build fortifications or walls. Additionally, it is beneficial to be familiar with the newest digital Army systems.

In this job, you must display the professionalism and expertise associated with the Engineer Regiment daily. You must also be able to think on your feet. For example, when the task force S-3 asks you how to reduce the blast radius of a simulated IED, you must have an answer for him. In this particular instance, I have developed a system that has now become the division standard for simulated IED strikes.

While deployed to the Joint Readiness Training Center, Fort Polk, Louisiana, where we implemented the newest unit of action (UA) system with all the pieces together for the first time, I learned several lessons. The first lesson is that you're not guaranteed an engineer platoon leader since the engineers belong to the brigade and not directly to the task force. Therefore, you need to automatically plan on being the engineer who will be on the ground with the task force. What you need should be planned and resourced before you depart for training or combat. Ensure that you have an assigned area to work in the tactical operations center (TOC). You should also include your job description and duties in the tactical operations center standing operating procedures (TOCSOP). I recommend adding the following to the TOCSOP:

Reconnaissance Sergeant

- Advise the commander.
- Track the status of all routes.
- Coordinate, track, and make recommendations on force protection measures.
- Assist the S-2.
- Oversee the cache collection point.
- Track enemy IED activity.

Within the TOC, I was required to track current operations, plan for future operations, and provide technical expertise and assistance with force protection on the FOB. Within the FOB, there will be a cache collection point for captured enemy supplies and equipment. Various ideas have been expressed about the responsibility of the engineer on the ground and the requirements for this storage area. As a force protection measure, it is in the best interest of the task force to ensure that an engineer or explosive ordnance disposal (EOD) technician routinely checks the storage of items and—prior to implementation of the site—inspects it to ensure proper storage. All items need to be treated with the same care as is given to friendly munitions. An inventory should be kept and continuously updated. Prior to execution, a plan should be put in place that details individual responsibilities. I am currently writing an SOP for my unit for this operation.

As an engineer assigned to this position, it is vital that you are not assigned to fill one of the previous roles established in the S-3 shop. I have seen other battalions use their engineer as the land and ammunitions noncommissioned officer (NCO). This doesn't allow that individual to assist the battalion and task force engineer with the MDMP. His expertise as an engineer is not being implemented. The position and title on the modified table of organization and equipment (MTOE) is *reconnaissance sergeant*. I always try to keep that in mind when I

accept a new responsibility. In order to keep my job separate, I have had to be very selective in my acceptance of responsibilities. I work for the S-3 and the S-3 noncommissioned officer in charge (NCOIC)—not for the engineer company. Otherwise, I have been given lots of freedom to develop the duties and responsibilities of the reconnaissance sergeant position.

I hope that this information will help fellow engineers who fill this position. I look forward to hearing from other engineer reconnaissance sergeants who may have developed additional tactics, techniques, and procedures. They may have better ideas or better ways to implement the engineer into the battalion operations cell. When I hand this job off to the next NCO, I want him to know his duties and responsibilities and be able to succeed in the position.



Staff Sergeant Way is the reconnaissance sergeant for 1-87th Infantry Battalion, Fort Drum, New York. He has served as a squad leader and team leader in the 41st Engineer Battalion, Fort Drum; and squad leader and assault section sergeant, 40th Engineer Battalion, 1st Armored Division, Baumholder, Germany. He has deployed to both Kosovo and Iraq. A graduate of the Primary Leadership Development Course, Basic Noncommissioned Officer Course, and Sapper Leader Course, he is working on a degree in business management.

The New Cavalry Leader's Course

By Major Matthew A. Dooley

The challenges of the U.S. Army's force modular redesign are upon us, and we are addressing the necessary changes with the grim, professional determination of an Army at war. Our efforts to make units of action (UAs) a reality have demanded some fundamental shifts in our thinking about how brigade combat teams (BCTs) are organized and how they are expected to fight. The role of cavalry has not been spared this reexamination. One of the latest efforts to ensure that the Officer Education System at Fort Knox, Kentucky, remains current and relevant is the Armor School's recent redesign of the Cavalry Leaders Course (CLC).

As we change our force structure, so must we also reconfigure our assumptions about who should attend the CLC. The combined arms philosophy that underpins the logic behind creating UAs demands that all officers, regardless of branch, who are assigned to the BCT (UA) planning staffs or to the reconnaissance squadrons within these brigades, understand reconnaissance and security operations. Leaders who attend the CLC are provided with the in-depth knowledge of reconnaissance and security, as applied to the new reconnaissance squadrons found in the heavy brigade combat teams (HBCTs), infantry brigade combat teams (IBCTs), and Stryker brigade combat teams (SBCTs). The CLC accomplishes

its learning objectives through challenging practical exercises that test and hone the students' understanding of doctrine; tactics, techniques, and procedures; organizations; missions; capabilities; and limitations of reconnaissance, surveillance, and target acquisition (RSTA) and reconnaissance squadrons.

The Armor School encourages CLC enrollment for all Armor officers and extends an invitation to leaders in Infantry, Field Artillery, Engineer, Aviation, Military Intelligence, and Signal Corps Branches who are assigned as planners or commanders of RSTA/cavalry organizations in the UAs. Attendance at CLC is open to graduates of any officer career course in the grades of first lieutenant (P) through major. Enrollment is available through the Army Training Requirements and Resources System (ATRRS).

The Web site for the course is at <http://www.knox.army.mil/school/16cav/octeam.asp>. Once you are there, click on "Student Info," then "Cav Leader (CLC)." The point of contact is Major James Turley. He can be reached at james.turley@knox.army.mil or (502) 624-1324 or DSN 464-1324.



Major Dooley is a former Cavalry Leader's Course instructor/officer in charge.



Engineer Mobile Training Team

Standing Up the Afghan National Army Engineering School

By Captain Eric G. Nichols

An engineer mobile training team (MTT) comprised of United States Army Reserve Soldiers was deployed in support of Operation Enduring Freedom, with a mission of building the new Engineering Corps of the Afghan National Army (ANA). The primary objective of the MTT was to train the ANA soldiers in basic combat engineer skills during a six-week advanced individual training (AIT) and to provide refresher training to the previous American-trained engineering support companies of the ANA. The secondary objective was to train the trainers by mentoring and guiding the ANA instructors with a modified program of instruction (POI) from the United States Army Engineer School (located at Fort Leonard Wood, Missouri).

This POI was custom-tailored to meet the needs of the ANA with an emphasis on mine warfare, basic demolitions, and combat construction (focused on wire obstacles and survivability positions). This MTT directly assisted in establishing the first ANA Engineering School (based on the United States Army Engineer School). At the time this article was written, ANA instructors were conducting all student instruction, which is a positive sign that soon the new school will be able to operate without U.S. support.



Coalition activities on a Romanian qualification range

Mission Preparation

The MTT began the mission by conducting Soldier readiness processing for two weeks at the continental United States (CONUS) Replacement Center, Fort Benning, Georgia. Upon completion, the MTT visited the United States Army Engineer School for two weeks where the team had an opportunity to meet with former MTT members. These Soldiers did an outstanding job of preparing the team for what to expect from the ANA.

The team then returned to Fort Benning for final preparations and deployed on 8 November 2004. They arrived at Bagram Airfield in Afghanistan during the predawn hours of 10 November. While waiting for transportation, the team could hear explosions in the distance and became fully aware that they had indeed arrived in a hostile-fire area. Loading into the back of a 5-ton cargo truck, they began the trip to the training destination.

As the team left the airfield, they saw the first of many minefields along the side of the road. Scattered among the minefields were derelict T-62 tanks, remnants of past conflicts. Traveling through the outer gate of the airfield, the team entered a village that consisted of mud and stone buildings that bear the scars of decades of war. The landscape was desolate and barren and marked with hull defilade armor fighting positions and troop trenches. It was clear that warfare had been a way of life for the Afghan people for many years.

The MTT spent the first month setting up quarters (general purpose [GP], medium, tents) at the camp where they were assigned. They inventoried training sets and prepared to instruct the first ANA class.

Training

The first training mission was at an ANA garrison, where the MTT conducted refresher training for two ANA engineering companies. From 11 December 2004 to 8 January 2005, the students (officers and noncommissioned officers [NCOs]) were very attentive and eager to learn. Classroom discipline was maintained by the leadership of each company, creating a positive learning environment. When outside training was conducted, the ANA students marched with great pride to their respective training areas. To bring additional honor to both units, a few were selected by the ANA leadership and the MTT to become student instructors. These students had the distinct privilege of training their fellow classmates, thus making the ANA more self-reliant.

During the two weeks prior to the next refresher training, which began on 24 January 2005, the team met its new ANA counterparts and integrated them with the engineer POIs. From the first day of class, ANA members served as assistant instructors for every class.

Due to the large volume of students, the company was divided into two groups, and a rotational class schedule was established. On the first day of the cycle, U.S. Soldiers served



The remains of a maintenance shop in a former Taliban headquarters

as primary instructors while ANA instructors took notes. On the second day, the ANA instructor became the primary instructor. At the end of each class, the U.S. instructors conducted a review to ensure that the ANA students understood the lesson that had been taught.

The refresher training program gradually evolved to where an ANA instructor taught with a U.S. instructor present, while another ANA instructor rehearsed for the next day's class with another U.S. instructor. By the midpoint of the training, additional instructors had joined the training cycle. And by the end of the refresher training, the ANA was spending more time instructing than their U.S. counterparts. The earlier policy of selecting exceptional students from the class to become student instructors continued.

While instruction to the ANA engineering support companies was being conducted, a U.S. instructor began writing the training support packages (TSPs) for the military occupational specialty 21B combat engineer course. He wrote 32 TSPs, of which 17 required a visual-guided training package for support. The entire course was completed electronically on 2 February 2005. Once the TSPs were completed, the instructor supervised the interpreters in the translation from English to the Dari language.

On 26 February 2005, the MTT began teaching the first 21B AIT course. The refresher training gave the ANA instructors an opportunity to see and use the course material; they were now ready to conduct training with minimal assistance. Because the AIT POI contained some new and previously untaught material, the U.S. instructors continued with the rotational cycle, leaving time for instructor rehearsals of the



An old Soviet T-34 tank along the training center range road

new material. During AIT, the ANA instructors always served as the primary instructors. The ANA instructor corps continued to grow, and on 30 March 2005, they single-handedly conducted the graduation ceremony.

Final Phase

After the AIT graduation, the MTT began preparations for disengagement. During the first week of April, the team conducted a Total Army Instructor Training Course (TAITC) for the ANA instructors. The purpose of the TAITC was to ensure that the ANA instructors were teaching from the TSPs that had been prepared for them in February. The class also introduced the ANA instructors to new techniques for improving future classroom instruction. At the end of the course, all the new instructors had shown remarkable improvement.

During the second week of April, the MTT and ANA instructors conducted an inventory of the classrooms, training-aid containers express (CONEXs), and the office space. By the third week of April, the MTT had completed a handover to the ANA. The ANA team leader now had full accountability for the entire ANA Engineering School.

Conclusion

The MTT was blessed and fortunate enough to stay out of harm's way. Though not making the media headlines as often as Iraq, Afghanistan still presents a great deal of danger for our Soldiers. During the team's six-month stay in Afghanistan, reports were heard of improvised explosive devices (IEDs) exploding on the road that the team traveled every day, and once they convoyed past several IEDs fashioned from old mortar rounds. Team members observed local nationals burying mines in the roadway, resulting in the marking-off and securing of the area.

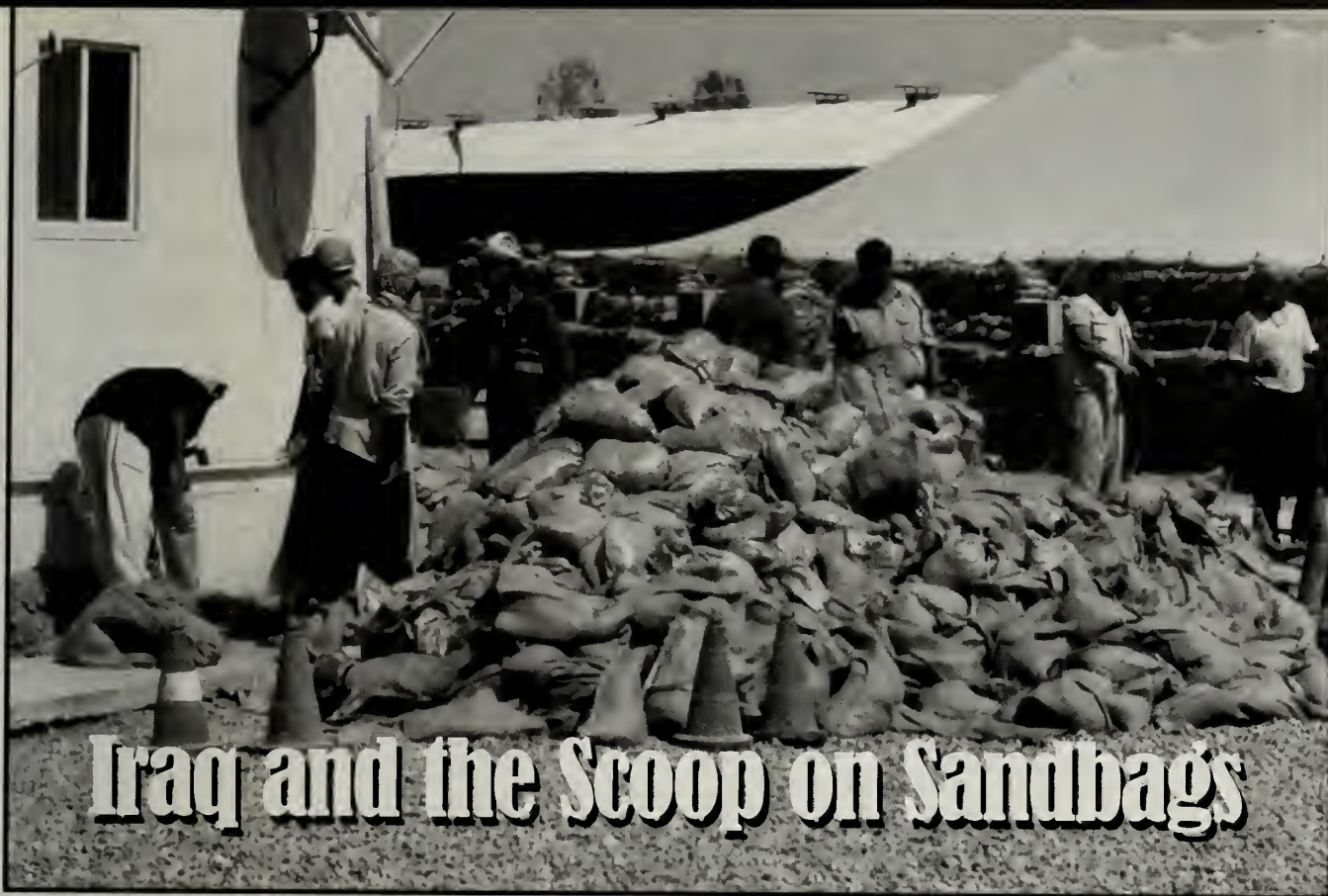
While the MTT was fortunate, the camp where they were located experienced the devastating loss of four Soldiers who were conducting a range reconnaissance. These Soldiers lost their lives after their vehicle ran over an old Soviet antitank mine. The mines and unexploded ordnance (UXO) left behind by the Soviet occupation are unbelievable. Every time a major rainfall occurs, more mines are revealed. During the freeze-and-thaw cycles of winter, the frost heaves push up new dangers. Two ANA personnel lost their feet after stepping on antipersonnel mines in their "cleared" training area. To help alleviate the problem, the MTT expanded its mission into explosive ordnance disposal and disposed of 13 UXO, 100 badly decayed claymore-type mines, and about 30 pounds of old Soviet-style composition cyclotrimethylenetrinitramine-4 (C-4) and trinitrotoluene (TNT).

In final review, this engineer MTT –

- Trained ANA personnel to become engineers or to improve their engineering skills.
- Trained and mentored ANA instructors (officers and NCOs).
- Established the first "post-Taliban" ANA Engineering School.

The MTT played an active role in Operation Enduring Freedom by helping to ensure that the ANA can bring safety and security to their own country by keeping insurgents and terrorists from finding safe harbor in Afghanistan. 

Captain Nichols serves as the executive officer and S-3 of the 1st Battalion, 3d Brigade, 80th Training Division, Regional Training Site-Engineer (RTS-E), Camp Dawson, West Virginia.



Iraq and the Scoop on Sandbags

By Ms. Dana L. Finney

For shoring up a river bank to stem flood waters, the idea is to use sandbags that will eventually disintegrate so they won't have to be retrieved. But when sandbags are going to be used to fortify a base camp in Iraq, they need to stay intact as long as possible. Sandbag materials differ in their resistance to the elements—especially ultraviolet radiation. In response to reports that sandbag fortifications have failed under the intense sunlight in Iraq, the United States Army Engineer Research and Development Center (ERDC) conducted a study to identify which materials maintain tensile strength the longest under ultraviolet radiation exposure. Tensile strength is the property most closely associated with the material's integrity and—when weakened—allows the bags to break, and sand spills out.

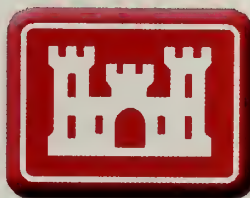
In a simulated desert climate, ERDC's Construction Engineering Research Laboratory (CERL) found (through independent, certified laboratory testing) that cotton duck material performs best. Acrylic sandbags also performed well in the study. The complete report with test data is available at <http://www.ccer.army.mil>. For more information, contact Alfred Beitelman or Charles Marsh at CERL, 800-USA-CERL.



Ms. Finney is a public affairs officer for the United States Army Engineer Research and Development Center, Construction Engineering Research Laboratory, Champaign, Illinois.



These sandbags, used for fortification in Iraq, failed due to extreme exposure to ultraviolet radiation.





Coyote Engineers Support CJTF-76

By Colonel Nancy J. Wetherill

When U.S. forces entered Afghanistan to strike Al Qaeda training camps and Taliban military installations in early October 2001, the world witnessed unconventional applications of military force. Well-trained troops operating complex weaponry—supported by the latest technology—hammered deadly blows against a tough and elusive enemy. Yet, intermingled with the sophisticated gear and tactics were American Soldiers riding horses onto the battlefield.

Contradiction? No, that mixture of new and old remains a reality for U.S.-led coalition tactical forces as they continue to neutralize terrorist organizations and help Afghan citizens rebuild their Texas-sized nation—a landlocked and resource-poor country that has endured an unfair share of misery. Likewise, military engineers involved throughout Operation Enduring Freedom tackle demanding missions with their own versions of new and old.

Survey instruments guide airfield-design teams to mark the corners of runway concrete forms and roadway grade stake locations with put-it-right-there precision. Hundreds of miles away at a forward operating base (FOB), one or two Soldiers rely on common sense and instinct to lay out a leach field for

a shower facility by trusting timeless laws of gravity and plumbing—water flows downhill.

Three years after the first U.S. strikes in Afghanistan, pockets of Taliban, Al Qaeda, and splinter groups remain. Combined Joint Task Force (CJTF)-76 led the U.S. and coalition response during a 12-month cycle that began in May 2004 and continued to take the fight to the enemy in many remote locations. The 109th Engineer Group and its subordinate Army National Guard and United States Army Reserve battalions, plus forces from coalition partner nations, served as the headquarters for the CJTF-76.

Task Force Coyote

The 109th Engineer Group directed and supported engineer operations at more than forty locations. The unit borrowed from its shoulder sleeve insignia and named the task force *Coyote* and provided a quick lesson to everyone that the proper pronunciation for the wily canine's common name is *ky-oat*—never *ky-oat-tee*.

During their year on the ground, Task Force Coyote engineers worked from a couple of airfields and scores of remote sites. Missions included—

- Airfield and rotary-wing ramp expansion, repair, and maintenance.
- Base camp, facility, and infrastructure construction and sustainment.
- Electrical, water, and sewer systems design and installation.
- Construction contracting.
- Quality assurance/quality control (QA/QC) for local national construction.
- Mine clearing, demining, and route clearing.
- Road construction.

The task force picked up the engineer mission from the 416th Engineer Group. Soldiers of the 65th Engineer Battalion formed the nucleus of the CJ7 (engineer) cell for CJTF-76, and as its parent, the 25th Infantry Division commanded all operations.

Priority of Engineer Effort

When the 109th Engineer Group arrived in Afghanistan, the engineer effort consisted of mobility, survivability, and general engineering missions. Mobility tasks included airfield expansion, with the construction of parking ramps and rotary-wing parking. Survivability tasks were the construction of guard towers, HESCO® perimeter barriers, and entry control points. General engineering tasks included design and construction of tactical operation centers, dining facilities, latrines, showers, and tent platforms. These priorities are underpinned by mine and unexploded ordnance (UXO) clearance, which is defined as a



Photo by Colonel Nancy J. Wetherill

Afghans travel along the Tarin Kowl road as Task Force Coyote construction crews install culverts and shape the roadway while other Soldiers provide security.

mobility task but enables the achievement of all engineer priorities.

During the days leading up to and including the Afghan national presidential elections, the engineer priorities were reconstruction, facility upgrade and maintenance, and combat engineering. The reconstruction effort centered on the construction of the Kandahar to Tarin Kowl road, a route that is the lifeline for Afghans in the Oruzgan Province. Engineers at base camps continued to upgrade life-support facilities, and the combat engineer task of mine clearing at the two airfields was in full swing.

After the successful presidential elections, CJTF-76 transitioned to operations intended to include the period through the national parliamentary elections. The priority of



This K-Span panel section for the Bagram Detainee Facility is guided into place with the help of a crane and Soldiers with tether ropes.

Photo by Colonel Nancy J. Wetherill

A Soldier from a military mine dog detachment works with his dog to find and mark potential explosive devices.



Photo by Colonel Nancy J. Wehenell

engineer effort became reconstruction, mobility, and survivability. In addition to airfield expansion, mobility tasks now included repairing secondary roads, which were lines of communication to outlying camps.

Provincial Reconstruction Teams

The Provincial Reconstruction Teams (PRTs) extend the reach of the Afghan government by taking its influence beyond its national capital in Kabul. PRTs are stabilizing factors that help Afghans rebuild roads, drill wells, and construct schools and police stations, while establishing security in the region.

The U.S.-led PRT initiative builds relationships with the Afghan people, provides needed infrastructure development, and improves quality of life. PRTs are intended to bring security to the sites where they are located. The teams consist of infantry, civil affairs, engineer, medical, logistical, and United States Aid for International Disasters (USAID) personnel and Afghan security forces.

Task Force Coyote was responsible for the stand-up of four PRTs, which involved construction of facilities through contracts with local Afghan companies. The task force was also responsible for the QA/QC of the construction and served as the engineer representatives at six PRT sites.

Mine-Clearing/Demining

Military mine-clearing operations consisted of area and route clearance. Standard demining and mine-clearing methods were used to destroy mines and UXO. U.S. military mine clearers adopted the demining technique but left the mine/UXO retrieval and disposal to the Polish or RONCO Consulting Corporation (an international firm specializing in humanitarian demining assistance).

RONCO's dogs and the U.S. military mine dog detachment shortened the time needed to proof an area that had been reduced by mechanical means.

The current inventory of mine-clearing equipment used by the Army, coalition forces, and RONCO is state-of-the-art. Mechanical equipment has proven to be very resistant to mine and UXO strikes, protecting Soldiers and limiting damage to equipment.

During their occupation, Soviets placed a number of protective mine lines around major installations. These lines are marked, making them easily identifiable. The Soviet mine-laying technique is predictable, with a discernable pattern; however, the Northern Alliance and Taliban fighters reseeded many of the mines, leaving no documentation. Their lack of mine emplacement knowledge adds to the danger for military mine clearers.

Road Construction

The construction of the Kandahar to Tarin Kowt road marked the first major U.S. military road construction in Afghanistan. The road—from Kandahar City through the Hindu Kush Mountains to the city of Tarin Kowt—was a joint effort with USAID, the United Nations Office of Project Services (UNOPS), and the U.S. military. USAID provided the funding; UNOPS contracted the placement of base course material and double bituminous surface treatment (DBST); and Task Force Coyote did the surveying, the placement of culverts, and the construction of the roadbed to the subbase surface.

The first base camp, FOB Tiger, was constructed in two weeks. Work was performed throughout the year by a company-plus of combat heavy engineers. Security was provided by troops from the 3d Brigade, the 25th Infantry



Soldiers of Task Force Coyote construct concrete forms in preparation for placement of concrete to increase aircraft parking space at Bagram Airfield. In the background, the dust flies as crews work ahead of the concrete placement group.

Division, and Afghan security forces. The region is considered a birthplace of the Taliban, and remnant fighters remain in the area. By mid-November, FOB Tiger was moved farther down along the road, and no enemy contact occurred after an initial attack.

Challenges

As a landlocked country, Afghanistan has few roads and even fewer paved highways, so moving troops, equipment, and materials is a challenge in itself. Local national transportation support was used for surface movement of supplies and equipment from the Port of Karachi, Pakistan, and in and around the combined joint operation area. It could take weeks for items to arrive, and worker strikes at the port were common, sometimes delaying shipments for months. United States Air Force aircraft and a global delivery service ferried some critical items.

On occasion, insurgent attacks on civilian Afghan delivery trucks (known as *jingle trucks* because of the decorative metal tassels hanging from the bottom of the truck frames that jingled when the trucks moved) resulted in damaged or destroyed equipment. In some areas of the country, the jingle truck drivers would request U.S. escort through known trouble spots.

The shortage of plumbing and electrical supplies and good quality lumber often caused long delays in completing missions. Non-U.S. plywood is very flimsy—sometimes requiring a doubling of materials to meet standards. Electrical and plumbing materials just did not exist in Afghanistan, so as an expedient partial solution, a team was sent to Germany to locally purchase the needed items.

Accomplishments

In spite of the challenges Task Force Coyote personnel faced, they were able to accomplish several significant missions:

- Construction of parking ramps and the rotary-wing parking at the two airfields were the largest concrete missions. But

before the concrete could be placed, mine clearing and extensive site preparations were required.

- Two detainee facilities were the largest buildings constructed. The facilities included showers, toilets, administrative offices, and community and isolation cells.
- Base camp construction and upgrades consumed many hours of labor, resulting in the construction of more than 150 tent platforms on 45 separate base camps and more than 85,000 square feet of administrative buildings.
- With the use of U.S., Polish, and RONCO personnel, more than 627 acres have been reduced and 508 acres proofed. The occasional mine strike on mechanical equipment did not result in any injury to personnel.

Conclusion

The Operation Enduring Freedom mission for this engineer group headquarters was nearly textbook in its task organization and operation. The CJTF-76 commanding general allowed Task Force Coyote to effectively use engineer assets throughout the combined joint operation area. Keeping engineer units under the control of an engineer headquarters maximized engineer capabilities available to the command. Coyote engineers from five countries came together for a common cause. They maintained flexibility, while executing thorough staff planning. The result: An overwhelmingly successful, 12-month engineer mission.



Colonel Wetherill is the commander of 109th Engineer Group (Combat), South Dakota Army National Guard, and served as the commander of Task Force Coyote. Previous assignments include commander of the 109th Engineer Battalion, State Public Affairs Officer, and commander of the 129th Public Affairs Detachment. She is a graduate of the Army War College and holds a master's from South Dakota State University.



ENGINEER UPDATE

Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Urban Mobility Breaching Course (UMBC). The UMBC is a 3-week course conducted at Camp Lejeune, North Carolina, by the United States Marine Corps, with assistance from three United States Army engineers. Two weeks of the course are consolidated training, and the remaining week is Army-unique. The maximum Army course load for the UMBC is 15 students. Slots for the course can be reserved through the Army Training Requirements and Resources System (ATRRS).

The UMBC provides advanced information on urban breaching operations. The course consists of in-depth explosive theory; detailed planning that combines operational and training safety issues; urban reconnaissance; and employment of urban breaching assets, including explosive, manual, and ballistic breaching techniques for urban operations. The UMBC teaches the use of Current Force equipment that supports mobility operations in support of the maneuver force.

Students must meet requirements listed in Department of the Army Pamphlet 611-21, *Military Occupational Classification and Structure*, and Army Regulation 600-9, *The Army Weight Control Program*; be a combat engineer noncommissioned officer in the grade of E-5 (P) through E-7 and a graduate of the combat engineer Basic Noncommissioned Officer Course (BNCOC); have no

pending Uniform Code of Military Justice (UCMJ) actions; and have no limiting profiles.

Fiscal Year 2006 Class Schedule

Class Number	Report Date	Graduation Date
01-05	16 Oct 05	4 Nov 05
02-05	27 Nov 05	16 Dec 05
03-05	22 Jan 06	10 Feb 06
04-05	26 Feb 06	17 Mar 06
05-05	4 Jun 06	23 Jun 06
06-05	13 Aug 06	1 Sep 06
07-05	10 Sep 06	29 Sep 06

The point of contact for this course is the Directorate of Training and Leader Development (DOTLD) Sergeant Major at (573) 563-4094, or e-mail <atsedot@wood.army.mil>. The DOTLD Web site is at <http://www.wood.army.mil/dotld/>.

New Mission Training Plans (MTPs). The following Army Training and Evaluation Program (ARTEP) MTPs will soon be available on the Army Training Information Architecture (ATIA) Web site at <https://atiam.train.army.mil/>:

ARTEP 5-063-10-MTP, Mission Training Plan for the Mobility Platoon, Engineer Company, Brigade Combat Team

ARTEP 5-063-11-MTP, Mission Training Plan for the Mobility Support Platoon, Engineer Company, Brigade Combat Team

ARTEP 5-063-35-MTP, Mission Training Plan for the Engineer Company, Brigade Combat Team

ARTEP 5-500-35-MTP, Mission Training Plan for Engineer Companies (applies to the following company-level tables of organization and equipment [TOEs]):

05417G000 (horizontal company)

05418G000 (vertical company)

05419G000 (engineer support company)

05437G000 (clearance company)

05438G000 (mobility augmentation company)

05439G000 (sapper company)

ARTEP 5-500-68-MTP, Mission Training Plan for Engineer Staffs (applies to all engineer staffs except the Prime Power Battalion).

For more information, contact the Collective Training Division at <joseph.toth1@us.army.mil> or call (573) 563-7821.

Center for Engineer Lessons Learned (CELL). The United States Army Engineer School CELL needs your help. To keep training, doctrine, and combat developments current and to prepare for the future, it is critical that the school continuously receive relevant engineer observations, insights, and lessons (OIL). The CELL can derive information from a variety of sources: unit after-action reports (AARs); tactics, techniques, and procedures (TTP) used by units in and returning from theater; Soldier observations/submissions to the Engineer School; and requests-for-information (RFIs).

This information is used to conduct doctrine, organization, training, material, leadership, personnel, and facilities (DOTMLPF) gap analysis and to determine

solutions. These solutions are distributed to the Engineer Regiment via new doctrine and training products, the Engineer Professional Bulletin and other publications, Web sites, and by answering RFIs. (The Engineer School RFI Web site provides the Engineer Regiment a reach-back capability.)

You can help by forwarding any of these materials from your unit's deployment to the CELL point of contact. Unclassified information can be sent by e-mail to <Doctrine.Engineer@wood.army.mil> or <reggie.snodgrass@us.army.mil>. Classified information can be sent by secret Internet protocol, routed (SIPR) e-mail to <snodgrassrg@monroe.army.smil.mil>. For more information, call (573) 563-4117.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since the last issue of *Engineer*, or were inadvertently omitted from a previous list. We dedicate this issue to them.

First Lieutenant Carlos J. Diaz	2d Battalion, 69th Armor Regiment	Fort Benning, Georgia
Sergeant Andrew J. Jodon	3d Battalion, 69th Armor Regiment	Fort Stewart, Georgia
Staff Sergeant Lincoln D. Hollinsaid	11th Engineer Battalion	Fort Stewart, Georgia
First Lieutenant Louis E. Allen	HHC, 42d Infantry Division	Troy, New York
Captain Phillip T. Esposito	HHC, 42d Infantry Division	Troy, New York
Private First Class Seferino J. Reyna	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
First Lieutenant Aaron N. Seesan	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Specialist Tyler L. Creamean	73d Engineer Battalion, 25th Infantry Division	Fort Lewis, Washington
Sergeant First Class Michael D. Jones	133d Engineer Battalion	Belfast, Maine
Staff Sergeant Jeffery J. Farrow	146th Quartermaster Company	Fort Totten, New York
Sergeant Larry R. Arnold, Sr.	150th Engineer Battalion, 155th Brigade Combat Team	Lucedale, Mississippi
Specialist Samuel R. Bowen	216th Engineer Battalion	Hamilton, Ohio
Specialist Casey Byers	224th Engineer Battalion	Ottumwa, Iowa
Specialist James D. Carroll	230th Engineer Battalion	Mckenzie, Tennessee
Corporal Randall D. Preusse	386th Engineer Battalion	Austin, Texas
Sergeant Joseph C. Nurre	463d Engineer Battalion	Weirton, West Virginia
Specialist Robert E. Hall, Jr.	467th Engineer Battalion	Greenwood, Mississippi
Specialist Patrick R. McCaffrey, Sr.	579th Engineer Battalion	Petaluma, California
Second Lieutenant Andre D. Tyson	579th Engineer Battalion	Petaluma, California
Staff Sergeant Charles H. Warren	648th Engineer Battalion	Statesborough, Georgia
Private First Class Mathew V. Gibbs	648th Engineer Battalion	Statesborough, Georgia
Specialist Robert G. Davis	864th Engineer Battalion	Fort Lewis, Washington
First Lieutenant Laura M. Walker	864th Engineer Battalion	Fort Lewis, Washington
Private Robert C. White III	864th Engineer Battalion	Fort Lewis, Washington
Sergeant Foster Pinkston	878th Engineer Battalion	Augusta, Georgia
Sergeant David J. Murray	1088th Engineer Battalion, 3d Infantry Division	New Roads, Louisiana

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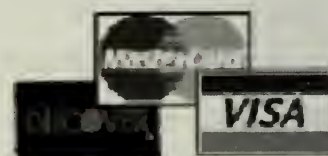
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Sergeant First Class Paul Ray Smith

On 4 April 2005, Sergeant First Class (SFC) Paul Ray Smith was posthumously awarded the first Medal of Honor for actions in support of Operation Iraqi Freedom. A combat engineer with Bravo Company, 11th Engineer Battalion, 3d Infantry Division, SFC Smith is the 14th engineer to receive the military's highest award.

Sometimes referred to as the *Congressional Medal of Honor*—because the President awards it on behalf of the Congress—the medal was first authorized in 1861, during the Civil War. Although more than 3,400 Medals of Honor have been awarded since then, they are bestowed only to the bravest of the brave, and that valor must be well-documented.

SFC Smith, who grew up in Tampa, Florida, enlisted in the Army in October 1989 and attended Basic and Advanced Individual Training at Fort Leonard Wood, Missouri. As a sergeant, he became known as a stickler for detail, a trait not always appreciated by his newer troops, who often found themselves doing things over and over again—until they got it right. But SFC Smith had learned from being in the first Gulf War how important it was to train right in order to be prepared for battle.

And because of SFC Smith's discipline, the lives of more than 100 American Soldiers were saved during a firefight near the Baghdad International Airport on 4 April 2003.

On that morning, the engineers were manning a roadblock near the airport when SFC Smith's platoon received a mission to construct a holding area for enemy prisoners in a courtyard next to a watchtower. As the engineers were clearing debris from the courtyard, they were surprised by about a hundred Iraqi soldiers, who opened fire on SFC Smith's men.

Disregarding his own life, and under constant enemy fire, SFC Smith organized a defense against the attack. After seeing that some of his men were wounded and in danger of being overrun, SFC Smith manned a 50-caliber machine gun atop a damaged armored personnel carrier. From a completely exposed position, he fought off the Iraqis, going through several boxes of ammunition and killing as many as 50 enemy soldiers as he protected his men and prevented an enemy attack on the aid station just up the road. SFC Smith continued to fire until he was fatally wounded—the only American to die in the engagement.

Ironically, in the last letter that SFC Smith wrote to his parents from Iraq (but never mailed), he spoke of being prepared to "give all that I am to ensure that all my boys make it home."

According to his wife Birgit, "He loved his country; he loved the Army; and he loved his Soldiers."

"It is an honor to share the title engineer with this great Soldier who exhibited extraordinary courage and selflessness. ...All Americans can take pride in the heroism of this great Soldier and leader, and the Engineer Regiment can be especially proud."

Lieutenant General Carl A. Strock, Chief of Engineers

"We count ourselves blessed to have soldiers like Sergeant Smith, who put their lives on the line to advance the cause of freedom and protect the American people. ...And we express gratitude for a new generation of Americans, every bit as selfless and dedicated to liberty as any that has gone on before—a dedication exemplified by the sacrifice and valor of Sergeant First Class Paul Ray Smith."

President George W. Bush

Sergeant First Class Paul R. Smith



Medal of Honor

Sergeant First Class Paul R. Smith distinguished himself by acts of gallantry and intrepidity above and beyond the call of duty in action with an armed enemy near Baghdad International Airport, Baghdad, Iraq, on 4 April 2003. ... As the fight developed, Sergeant First Class Smith braved hostile enemy fire to personally engage the enemy with hand grenades and antitank weapons and organized the evacuation of three wounded Soldiers from an armored personnel carrier struck by a rocket-propelled grenade and a 60-millimeter mortar round. ... During this action, he was mortally wounded. His courageous actions helped defeat the enemy attack ... while allowing the safe withdrawal of numerous wounded Soldiers.



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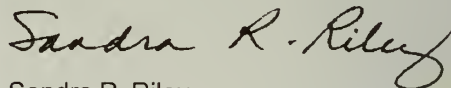
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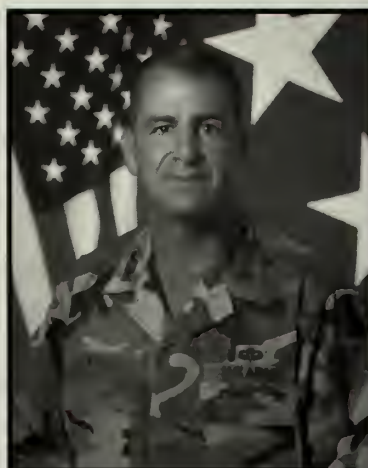
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Clear The Way

By Major General Randal R. Castro
Commandant, United States Army Engineer School



Welcome back to our Fall issue of *Engineer*. We are proud to get this latest issue out to the field. Because of the tremendous feedback we received on our last issue, we are running a second installment on engineer operations in urban and complex terrain. We continue to compile great input from the Regiment on this preeminent subject. This topic continues to challenge our Regiment and the Army. It is such a focused subject that we, in conjunction with the Army Engineer Association (AEA), considered how we could gather our experienced field commanders with the schoolhouse and leaders of industry to discuss the matter.



We were able to accomplish this dialogue the last week of October at the AEA Engineer Regimental Conference in Orlando, Florida. In his "Master and Commander" article on page 4, Lieutenant Colonel Tony Funkhouser goes into more detail on what was discussed. Let me tell you that it was one of the best engineer conferences ever. I say "ever" because of the positive feedback I received. It was a solution-focused week with an outstanding turnout of colonel and lieutenant colonel commanders and command sergeants major and key leaders from across the force from the Active, National Guard, and Reserve Components. Leaders were afforded the opportunity to voice their concerns and/or solutions to specific challenges we discussed during breakout sessions. These work groups exposed the passion our leaders have toward developing solutions to this complex problem of enabling mobility in concert with maneuver in urban and complex terrain. As many of you know, there is no "silver bullet" solution, so we must develop a holistic and comprehensive solution set.

A couple of years ago, the Engineer School spearheaded our doctrine development and trained the force on the

current doctrine and tactics, techniques, and procedures (TTP). Today, with a threat that is changing daily, our leaders in the field are developing not new TTP, but current "best practices" that have generated success for our engineers deployed in theater. We at the schoolhouse are able to capture these and will ensure that we train these **skills** to our young leaders heading out to the field. We are even seeking ways to procure the **tools** you say you need to accomplish the engineer missions you are performing as full-spectrum engineers! The challenge for our Regiment and the Army is that the next war will not be the war we are fighting today. Therefore, we must be

a future-focused organization to shape the Regiment while enabling the Current Force. No easy feat! It is your passionate input and dialogue with the Regiment that will allow us to enable the Current Force.

A special thanks to all who attended the conference and especially to the AEA leaders, the guest speakers—to include Lieutenant General Melcher, Brigadier General Ham, Major General Bostick, and Lieutenant General Strock (whose briefs can be found in the Engineer School's Army Knowledge Online [AKO] folder)—the leaders of industry, and those who worked diligently behind the scenes to make everything happen. Also, my thanks to all of you who shared your thoughts and experiences on our Regiment's No. 1 challenge by contributing to this professional bulletin!

Lastly, thanks to all our engineers who are on the front lines accomplishing the mission and preserving freedom. We, and the entire Regiment, are committed to support you and your families! You were all in our thoughts during the holiday season. Be safe and see you next issue!

Carry On!

• • • • •

We anticipate hosting another training seminar for the leaders of the Regiment during the first week of May 2006. Details will be provided soon on our Web site, on the *Message to the Regiment* e-mail, and here in *Engineer*, The Professional Bulletin of Army Engineers.

Lead The Way

By Command Sergeant Major Clinton J. Pearson
United States Army Engineer School



Greetings from Fort Leonard Wood, home of the Engineer Regiment! I would like to personally thank all of you for your steadfast and honorable service to our nation and our Regiment. Sappers are performing with distinction in Iraq and Afghanistan and in the wake of natural disasters here at home. Today's Soldiers are truly living the Soldiers' Creed. To the families that have lost a loved one, as well as those who have been wounded in action, you will remain in our daily thoughts and prayers. We are eternally grateful for the sacrifices you make each day; you will forever be our nation's greatest treasure.



This article will focus on changes we have seen over the past few months, using the T3 framework: Transform the Regiment, Train Soldiers and Leaders, and Take Care of the Regiment.

Today, the Modular Engineer Force has begun to take shape. We activated the 20th Engineer Battalion and the 507th and the 557th Firefighting Detachments at Fort Hood, the 19th Engineer Battalion at Fort Knox, and the 49th and the 94th Mine Dog Detachments at Fort Leonard Wood. Next in the Transformation starting blocks are the 18th Engineer Brigade, 20th Engineer Brigade, 36th Engineer Brigade, 82d Engineer Company, 618th Engineer Company, 642d Engineer Company, 887th Engineer Company, 275th Terrain Analysis Detachment, 362d Multirole Bridge Company, and 94th Engineer Battalion. To assist these units in the Transformation process, we implemented the Fusion Cell at the Engineer School. This cell has been instrumental in addressing issues regarding installation support, equipment, personnel, and deployment. Representatives from the United States Army Forces Command (FORSCOM); Assistant Chief of Staff, Finance (G-8); Office of the Chief of Engineers (OCE); Human Resources Command; Assistant Chief of Staff, Operations and Plans (G-3); and Assistant Chief of Staff, Personnel (G-1) have been an integral part in assisting the Regiment in transforming to the Modular Engineer Force, and we truly appreciate their support.

The desired way ahead for our Modular Engineer Force is to have command and control oversight over every engineer organization. The exceptions are those engineers embedded in the brigade combat teams (BCTs). Currently, the near future depicts four brigade headquarters: the 18th Engineer Brigade, 20th Engineer Brigade, 36th Engineer Brigade, and 130th Engineer Brigade. The brigade designs have changed, with one of the most significant improvements being the authorization

of a second staff sergeant major in each engineer brigade headquarters. We now have a two-year authorization for staff sergeants major in the 19th and 20th Modular Engineer Battalions.

Training embedded engineer Soldiers in the Heavy BCT (HBCT), Infantry BCT (IBCT), and Stryker BCT (SBCT) is not without its unique challenges. We must provide them with the right set of **skills and tools** necessary for today and tomorrow. In December 2005, we hosted a working group at Fort Leonard Wood for the embedded sapper company (Echo Company) in the HBCT. The purpose was to define current capa-

bilities, identify capability gaps, identify and recommend solutions, and document recommended solutions. The end state: provide HBCT sapper companies with the necessary skills and tools that enable mobility in concert with maneuver in urban and complex terrain. We must provide those companies with the very best equipment and capabilities available to accomplish their mission.

Another extremely important working group met at Fort Leonard Wood this quarter: First Army's NCO-led Improvised Explosive Device (IED) Defeat Working Group. Members of the Engineer School's Counter Explosive Hazards Center (CEHC) presented top-notch demonstrations that focused the group on techniques used by military working dogs, the interim vehicle-mounted mine detector (IVMMD), and the RG-31 medium mine-protected vehicle. Attendees included CSM Hill (First Army), CSM McCarty (Combined Arms Center), and representatives from Task Force IED, the National Training Center, and CEHC. The attendees realize that we owe it to our Soldiers to make the IED challenge our top priority. It was a very productive session, and all departed with a greater appreciation and understanding of technology intended to defeat IEDs.

My personal congratulations go out to all of you who made the master sergeant promotion list. Your selection is a testament of the Army's confidence in your abilities and your dedication to our Army and fellow Soldiers. Keep up the great work.

In closing, we continue to focus on the Global War on Terrorism, maintaining high standards and leading the way as engineers do. I hope everyone and their families had a safe and Happy New Year and that you remembered the Soldiers away from home who were not with their families. May God bless the fallen comrades and keep watch over our sons and daughters as we continue to fight the fight. Essayons!

MASTER AND COMMANDER:

ENGINEER LEADERS SEEKING THE SKILLS AND TOOLS TO CLOSE THE GAPS

By Lieutenant Colonel Anthony C. Funkhouser

Many of you did not have the opportunity to participate in the recent Army Engineer Association (AEA) Engineer Regimental Conference in Orlando, Florida. The conference was unique this year, with three tracks that allowed focused working groups in assured mobility, United States Army Corps of Engineers/Assistant Chief of Staff for Information Management/Information Management Agency (USACE/ACSIM/IMA), and AEA industry. It was a privilege to listen to different perspectives of the challenges we face in enabling mobility in concert with maneuver in urban and complex terrain. This article provides some feedback to the field on what the United States Army Engineer School Commandant, Major General (MG) Randal R. Castro, discussed and what the Engineer School is doing to close these gaps. The working group model allowed us to focus on current shortfalls and to use the Regiment's resident expertise to address these challenges and recommend solutions.

The conference began with a briefing from MG Castro, who broke down the problem using a common reference for all present: the military decision-making process. He laid out the facts and the specified and implied tasks and restated the problem of how best to enable mobility in concert with maneuver in urban and complex terrain. He laid out the doctrinal terms so everyone was on the same sheet of music. He explained that there is a difference in the old term of military



Engineer Soldiers conduct MOUT training with smoke.

operations in urban terrain (MOUT) and the new term of urban operations (UO). MOUT focused on a conventional force-on-force fight—fought on urban terrain—while UO is much more complex with our conventional forces fighting an unconventional force. In UO, there is a dynamic interaction with the population, the infrastructure, and the threat. We will have to use our ability to repair the infrastructure to influence the



Engineers use the "stack" technique during MOUT training.

population, thus denying the threat freedom of movement. MG Castro posed the question that maybe we should anticipate the future war to increase in complexity as a combination of MOUT and UO.

He also clarified the definitions of the three types of terrain. Most importantly, he laid out the difference in urban and complex terrain.

- *Urban terrain* includes airspace, supersurface, intra-surface, surface and ground, and subterranean corridor, infrastructure (including toxic industrial chemical storage and/or release), and human dimensions.
- *Complex terrain* is characterized by steep and heavily dissected terrain containing steep slopes with sudden elevation changes, circuitous gaps, and passes with a large number of severe slope variations. This includes arid and jungle environments.
- *Open and rolling terrain* primarily includes the topographic characteristics of flat desert and vegetated plains.

Once everyone understood the terms, he refocused on the problem statement: *How do we best enable mobility in concert with maneuver in urban and complex terrain?* This assured mobility challenge became our focus during the breakout groups. The Engineer School has focused on capability gaps in our recognized engineer formations. MG Castro explained that there is no "silver bullet" to remedy the problem. He refers to a "silver path" with a holistic set of solutions that incorporate doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF). The gaps that our silver path will focus on include the following:

- Movement/route clearance (countering improvised explosive devices [IEDs], vehicle-borne improvised explosive devices [VBIEDs], mines, and booby traps)
- Engineer reconnaissance/infrastructure assessment
- Urban engineer scout operations (brigade combat team [BCT] sappers)
- Masters of urban terrain
- Restoration and reconstruction
- Aging engineer equipment
- Engineer staff skills

MG Castro explained how the Engineer School is focused on closing these gaps by identifying the skills and tools that are needed in the Regiment. He succinctly laid out his vision of where the Regiment is headed and the progress made. This became his theme throughout the remainder of the brief. As we close these gaps, "The Regiment you see today...is not the Regiment of tomorrow." Our efforts to close the requirement gaps today will bring us closer to the capability requirements of the Future Engineer Force.



Soldiers use a mine detector to search for IEDs in Iraq.

A couple of years ago, the Engineer School led the way on doctrine and tactics, techniques, and procedures (TTP), while the combat training centers concentrated on training the collective force. However, only a couple of years later, the units in theater are developing new TTP daily from firsthand experience, and the role of the school has been to quickly capture the lessons learned, get them into our instruction, and redistribute them back to the field at large. The Engineer School has become a primary source of reachback knowledge on technical questions from the field as well. Full-spectrum operations have broadened our requirements for technical skills. Based on this paradigm, field units are the center of gravity for our current doctrinal TTP, which are really the current "best practices." The Engineer School will integrate these TTP into instruction, but simultaneously must be the architects of the Future Engineer Regiment. The Engineer School must look forward and understand that we will not fight the same war in the future. Therefore, the school must be a future-focused organization and shape the Regiment while continuing to enable the Current Force.

The Engineer School has had great success in closing a number of gaps. The school is working with the Ordnance School to better integrate engineers and explosive ordnance disposal (EOD) personnel at the BCT and task force levels. We are successfully expanding the role of engineers with IEDs, unexploded ordnance (UXO), and captured enemy ammunition (CEA). We have worked closely with EOD personnel to publish Field Manual Interim (FMI) 3-34.119, *Improvised Explosive Device Defeat*, and established protocols for commanders to use in theater. This has increased our sapper capabilities. The Explosive Ordnance Clearance Agent (EOCA) Course is training more engineers each month and awarding an additional skill identifier (ASI).

The mine detection and search dog programs are also growing since there is a great demand in theater for search dogs. The Engineer School will continue to grow its mine dog detachments and anticipate a continual increase in the number of dogs available for the field.

MG Castro has placed a great deal of emphasis on providing BCT sapper companies with the ability (skills and tools) to enable mobility in concert with maneuver in urban and complex terrain. He wants to use the integrated concept development team (ICDT) to make the engineer force mobility enablers as opposed to being used as infantry. What are the unique skills and tools we bring to the fight as engineers? The Counter Explosive Hazards Center (CEHC) identified the core tasks our Echo Companies in the BCTs are performing and cross-walked the skills and tools required. From there, they looked at commercial off-the-shelf options and prioritized them by cost. These capabilities will be made available to units that train in the CEHC programs. We still need assistance from the field, so if you have recommendations, please let us know. Additionally, CEHC is teaching the skills for engineers to operate the interim vehicle-mounted mine detector (IVMMD), the Buffalo mine-protected clearance vehicle, and the RG-31 medium mine-protected vehicle.

MG Castro continued with all the geospatial advances we have made with respect to the transformation. There are now geospatial organizations at every level of operational command. This has created the need to expand our military occupational specialty (MOS) 215D terrain warrant officer population. We have also improved the Digital Topographic Support System (DTSS) training for our geospatial personnel. For the remainder, we have continued to increase geospatial training in all our courses. What many of us knew as Maneuver Control System-Engineer (MCS-Eng) is now completely embedded into the MCS software and gives our engineers in the field a software package that allows the user to add attachments to graphic objects for more detailed information. This includes project files created in Microsoft® Project to track current construction projects.

Lastly, he explained where the Regiment stands on modernizing the fleet. Priority of effort is going to route clearance. The initial fielding of the IVMMD, the Buffalo, and the RG-31 to theater will be complete in the second quarter of



Interim Vehicle-Mounted Mine Detection System



RG-31 Medium Mine-Protected Vehicle

fiscal year 2006. Construction equipment dollars continue to flow for the high-mobility engineer excavator (HMEE) Type III and for the uparmoring of the deployable universal combat earthmover (DEUCE) and HMEEs. With respect to bridging assets, there are several hundred million dollars allocated to equip the multirole bridge companies (MRBCs) with dry support and ribbon bridges. Since the Wolverine bridge program is complete, we will work on procuring the expeditionary assault bridge to replace the armored vehicle-launched bridge (AVLB) for the heavy force.

MG Castro closed by stating, "We are a nation at war, and our No. 1 mission is to prepare Soldiers for war. We are too close to the problem at the school, so we need to solicit your help for solutions. There is a paradox of complex warfare in that we can't keep up with the complexities. We must have a reachback capability to tap into a knowledge base that addresses all aspects of engineer operations in full-spectrum operations. One solution set is for the Engineer School to provide mobile training teams like the Sidewinders at the National Training Center to reach out to our engineer units and train them on functional skills. The school must find the voids in our units and fill them with functional courses to provide the skills and tools. We must also be adaptive, especially as we deal with this complex warfare. We can guess that future war will be a combination of UO and the traditional MOUT—a combination of conventional and unconventional fighting in urban and complex terrain. The Future Engineer Force is where we are going, so don't wring your hands about it. We will work through the issues. We will protect what we have and continue to give the Army options. That is our commitment to you. I understand that the hazy part of our future is *maneuver support*, but you will eventually be a proud part of what develops from this."



Lieutenant Colonel Funkhouser is the Chief of Staff at the United States Army Engineer School.

ASSURING THE MOBILITY OF THE FBCT

By Captain Bryon L. Mansfield

Though the concept of assured mobility has been integral to military operations throughout history, it has not been explicitly addressed as a separate concept until recently. The concept of assured mobility encompasses all those actions that guarantee the force commander the ability to move and maneuver where and when he desires—without interruption or delay—to achieve his intent. This concept forms the basis for the mobility of a Future Combat Systems (FCS)-equipped future brigade combat team (FBCT).

The assured mobility concept has four imperatives and six fundamentals that, when conducted properly, reduce the likelihood of enemy interdiction and minimize the need for traditional breaching. These nested and overlapping critical tasks are essential to the assured mobility mission to prevent or mitigate impediments to mobility.

The four imperatives of assured mobility are—

- Develop the mobility input to the common operational picture (COP).
- Develop, establish, and maintain operating areas.
- Attack the enemy's ability to influence operating areas.
- Maintain mobility and momentum.

The six fundamentals of assured mobility are—

- *Predict* actions and circumstances that could affect the ability of the force to maintain momentum.
- *Detect* early indicators of impediments to battlefield mobility using intelligence, surveillance, and reconnaissance (ISR) assets; identify alternatives; and establish surveillance.
- *Prevent* potential impediments to maneuverability from affecting the battlefield mobility of the force by acting early; monitor and protect cleared routes.
- *Avoid* detected impediments to the battlefield mobility of the force; if prevention fails, identify alternatives.
- *Neutralize*, reduce, or overcome (breach) impediments.
- *Protect* against threat force weapons and tactics, techniques, or procedures effects through the application of technology or tactical behavior. This is a continuous process.

The Army's future warfighting concepts place a premium on the ability of the ground force to achieve a position of advantage at all levels of warfare to seize the initiative and conduct rapid, decisive operations. In the past, our conceptual thinking about providing mobility was centered on reactive measures. Our processes, task organizations, equipment procurement, and Soldier and leader training all centered on mitigating the loss of mobility. However, in the contemporary

operational environment, the challenges of an adaptive adversary and future warfighting concepts demand a fundamental shift from the old framework to one that emphasizes proactive mobility—the concept of assured mobility.

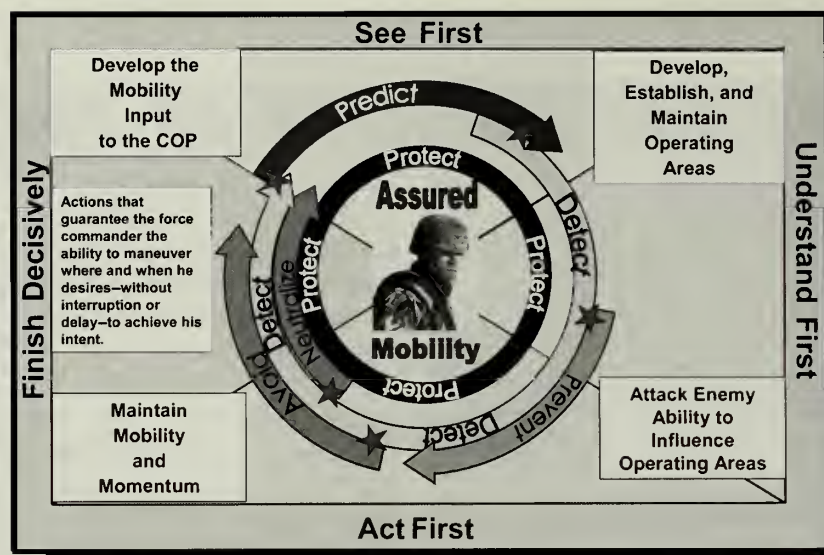
Assured mobility is a vital, enabling combined arms concept that defines one of the predominant roles of engineers and provides the linkage between their actions, force application, focused logistics, and protection. Achieving assured mobility requires a deliberate thought process that drives a series of overlapping and nested actions that will enable our forces to see first, understand first, act first, and finish decisively. This is a continuous process throughout the battle.

Current Force vs. FBCT

Mobility operations of the past hinged on embedding mobility enablers within the maneuver force because the technology of the time could not provide this capability at the platform level. The Engineer Regiment has undergone significant organizational changes over the years to bring this capability to the force. Regardless of the manpower issues, these enablers were relatively slow, large, and cumbersome vehicles that were easily identified, targeted, and eliminated by threat forces.

Aside from this, the majority of these rapidly aging assets existed in limited numbers. The operational effects of this were that the maneuver commander could not always move his units in a manner that facilitated speed, tactical initiative, and/or surprise. This limitation allowed the threat force into our decision cycles and gave them the ability to affect our maneuverability through the implementation of effective obstacle plans. Note that one of the key misunderstandings is that man-made obstacles are not typically employed to simply kill like other weapon systems. They are carefully placed to diminish the initiative, manpower, resources, or capabilities of one's opponent or to divert forces to areas that place them in a position of disadvantage.

There are two key differences at the macro level between the assured mobility of the Current Force and the FCS-equipped FBCT. The first is in the enabling technologies that permit a commander to predict and prevent or avoid impediments to the maneuverability of his unit earlier in a developing operation—the proactive piece mentioned earlier. The second is in the provision of mobility at the platform level. Key maneuver platforms will have the ability to locate, avoid, and/or survive the effects of many of the battlefield hazards that they will encounter. Coupling platform-level survivability with the predictive tools that identify hazards earlier greatly increases, at least in concept, the mobility of the FBCT. The simple math is that the less time spent in a reaction mode at an



Critical command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) linkages between processes/capabilities

obstacle or breach site, the lower the overall risk, the more lives saved, the more fully mission-capable vehicles, and the more firepower conserved for additional missions.

FBCT Assured Mobility

The vision of the FBCT overcomes many of these past shortcomings through key leaps in technology at a holistic level. The FCS is a uniquely large and complex U.S. Army acquisition initiative to develop a full range of technologically superior, interoperable, and cohesive systems. Often referred to as a "family of systems" or "system of systems," the combined capability of the FCS will be greater than the mere sum of its parts. Current plans equip the majority of our brigade combat teams (BCTs) between 2020 and 2030; however, we have already started the tenuous process of this transformation.

Field Manual (FM) 3-34, *Engineer Operations*, describes assured mobility as all those actions that guarantee the commander the ability to deploy into theater and maneuver where and when he desires without interruption or delay. However, this is not just about technical improvements to fighting platform mobility. It incorporates a better understanding of the friendly/enemy disposition and the three-dimensional battlespace (subterranean, ground-level, and aerial) to permit commanders to act first within the threat opponent's decision cycle to win the battle and finish decisively.

Superior situational awareness and selected fusion of information at various levels will provide leaders at all levels the tools necessary to make better-informed decisions on the fly. This improved situational awareness enables faster maneuver, not necessarily by moving faster, but by avoiding obstacles and providing the ability to recognize and converge on an open route or gap in an enemy defense.

The FBCT will achieve assured mobility through the employment of a family of systems that use a layered approach to harness the capabilities of the strategic, operational, and tactical

systems to conduct predictive analyses. Developing the situation begins by receiving mobility information from national collection assets, higher headquarters assets (special operations forces [SOF], sensors, and signal intelligence), and organic assets (unmanned aerial vehicles [UAVs], unmanned ground vehicles [UGVs], and sensors). However, in the FCS vision, every platform is also a sensor itself. All of this information is harnessed in the Battle Command Network, where it is fused with other sources of information in order to analyze it (with the help of automated tools).

The last step in this process is displaying the appropriate level of detailed information on the real-time COP. Leaders down to the small-unit level are enabled by the automated, virtual three-dimensional modified combined obstacle overlay (MCOO) to see potential impediments to maneuverability for both ground and air platforms (mobility choke points or potential enemy missile, rocket, artillery, and mortar systems). Every FCS manned platform, Future Tactical Truck System (FTTS), and Soldier system will provide information to enable these leaders to identify the best mobility corridors to support their schemes of maneuver, significantly expediting dissemination and implementation of this mobility data.

The commander will then use this information from the COP to develop, establish, and maintain an acceptable operating area. Choosing operating areas is critical to the commander's ability to focus reconnaissance assets. The leaders have access to automated decision aids that use predictive algorithms that will be programmed to consider enemy doctrine, tendencies, and history regarding obstacles and antiaccess techniques. These are combined with known enemy disposition and terrain information to develop a prediction of the enemy plan to deny the FBCT freedom of maneuver. Based on this predictive analysis, reconnaissance troops use aerial and ground sensors with radar-based mine detection sensors to identify mined areas. Keep in mind that other assets have likely been observing most of this future operating area long before the FBCT entered the theater.

First-dimension impediments along subterranean corridors (booby-trapped caves or utility access ways) and third-dimension impediments (enemy air defense artillery [ADA], Man-Portable Air Defense Systems [MANPADS], obstacles such as anti-air mines, and craters in runways at landing zones) are detected and avoided if possible. Based on detections, the commander selects and places demands on the intelligence system to further focus detection efforts in the operating area. Previous predictions are confirmed or denied, and an updated MCOO and predictive analysis are provided to commanders. This process is ongoing as it is today, but dissemination is much faster. This plan includes prediction of enemy actions and required sensor coverage to fill information voids within the operating area. Through this proactive process, ISR assets such as UAVs, unattended ground sensors (UGS), and/or the Intelligent Munitions System (IMS) may be assigned the role of observing critical areas to provide leaders with a higher fidelity of information before decisive commitment of assets to a given course of action. These ISR assets are linked with precision effects to form an active protective system that denies the enemy's ability to influence or degrade mobility at these critical points.

This is one way for the FBCT commander to attack the enemy's ability to influence lines of operation. These actions include any and all specific actions taken to preclude, deny, or prevent enemy maneuver or interdiction of FBCT routes. The commander proactively attacks those enemy systems capable of directly or indirectly impeding friendly ground or air maneuver, thus disrupting, neutralizing, or destroying his interdiction capability before it can be applied. The commander leverages capabilities such as precision munitions, dynamic obstacles (IMS and UGS), and joint effects to destroy enemy capability and deny him freedom of action. UGS and IMS are emplaced to overwatch key points on lines of operation and cue internal or external effects.

The combination of integrated attack operations (divisional/corps active/passive air and missile defense [AMD], aviation, and fires) enables domination and exploitation of the aerial battlespace and denies sanctuary to those systems that could impede friendly maneuver. Destruction of enemy air defense radars and weapons is the most effective shaping operation in support of third-dimension maneuver and is important in thwarting enemy antiaccess strategies at landing zones.

The FBCT must then maintain its mobility and momentum. Most mobility impediments can be mitigated through prediction, detection, and prevention. Impediments to ground mobility detected at standoff can be avoided by maneuver. There will be situations in which operational requirements dictate negotiation of areas that contain obstacles. These currently tend to use up the vast part of our operational time and resources. Even with decent intelligence, commanders typically are left in discovery-by-encounter roles that put troops and operations at increased risk.

In the future, the greater situational awareness provided to the commander will give him the ability to choose to avoid

impediments by bypassing them or require him to breach them. To avoid by bypassing or using precision neutralization will require knowing the precise locations of impediments (mines and improvised explosive devices [IED]; unexploded ordnance [UXO]; and chemical, biological, radiological, and nuclear [CBRN] hazards). To enable this, the combination of explosive ordnance/infrared radiation-equipped UAVs and UGVs with ground and aerial mine detection equipment will be employed. Wide-area surveillance from FBCT and divisional assets, and route reconnaissance by combined arms battalion assets, will identify changes from previous reconnaissance, thus identifying recently emplaced buried or surface-laid scatterable mines or the emplacement of IEDs to cue the ground mine-detection-equipped UGV. Change detection will allow leaders to find an unobstructed bypass or to precisely employ UGVs confirming the exact location of the mines and IEDs to neutralize (deactivate, jam, or destroy) them.

The FBCT will likely be dependent on augmentation from corps and/or division support modules to conduct traditional deliberate breach, CBRN detection and marking, and large gap-crossing operations. In areas with large concentrations of displaced civilians, civil affairs and psychological operations (PSYOPs) assets may be employed to mitigate the effects of displaced civilians on FBCT operations.

Conclusion

Providing assured mobility is a continuous process that must be applied en route to and beyond the objective. Distributed, layered capabilities are critical to reducing the effects of mobility impediments to the lowest acceptable levels of risk to the force. By applying the four imperatives and six fundamentals of assured mobility, the unit of action is able to maintain momentum, maneuver out of contact to achieve a position of advantage, and if required, conduct tactical assault at a time and place of its choosing. There are still plenty of challenges left in this process for leaders and technical engineers to manage over the course of the next 10 to 20 years. Despite the advances in technology, it will be the Soldiers and leaders of today's Army who will assure the mobility of the Future Force.

Author's Note: The development of this concept and of the FCS are the work of a great number of people. This article is based on TRADOC Pamphlet 525-66, *Force Operating Capabilities*, and conversations and briefings with many of its authors. FCS is recognized as fundamentally new and different, and as such, its organization and operations are merely the truth as it is today. The reality of the future may prove this analysis wrong. 

Captain Mansfield is an acquisition officer for the TRADOC Systems Manager-Assured Mobility, assigned to 1st Engineer Brigade, Fort Leonard Wood, Missouri. Previous assignments include company commander, S-3 operations, and assistant S-3 construction officer. He manages systems for explosive detection and neutralization for the Current and Future Forces. He holds a bachelor's in biology, specializing in genetics, from Purdue University.



COUNTER EXPLOSIVE HAZARDS CENTER

By Major Iain Church

The United States Army Engineer School Counter Explosive Hazards Center (CEHC) at Fort Leonard Wood, Missouri, is a fully operational and enduring organization providing the Army with innovative solutions to counter explosive hazards. Approved by the Army Assistant Chief of Staff, and Plans Operations (G3) in November 2004 with an effective date of October 2005, the CEHC has rapidly transformed from an ad hoc team to a fully functional Center of Excellence, while simultaneously supporting the Global War on Terrorism. The mission of the CEHC is to *"synchronize and integrate explosive hazards countermeasure concepts, technology, and materiel across the [doctrine, organization, training, materiel, leadership and education, personnel, and facilities] DOTMLPF spectrum to support assured mobility, protect the force, and counter explosive hazards in the contemporary environment."*

CEHC Initiatives

To stay ahead of the improvised explosive device (IED) threat in the contemporary operational environment (COE), the CEHC is working several initiatives to enable assured mobility in urban and complex terrain. Some major areas of focus are IED defeat contingency training, training

integration with the combat training centers (CTCs), route reconnaissance and clearance operations, military search operations, enhanced sapper company skills and tools, explosive ordnance disposal (EOD)/engineer integration, an engineer robotics system, and IED defeat information management.

IED Defeat Contingency Training

The CEHC fills the gap between institutional training and unit training requirements for the COE. Using state-of-the-art equipment and field-tested techniques, the CEHC develops and continually updates courses on IED awareness and defeat and delivers world-class training and support to joint forces involved in the Global War on Terrorism. This instruction enables units to receive theater-specific training prior to deployment, allowing them to focus on the mission during transition of authority. To ensure that the training is up-to-date and relevant, the CEHC gathers the latest intelligence on explosive hazards tactics, techniques, and procedures (TTP) employed by the enemy, as well as TTP developed by deployed units to counter that threat.

Training Integration With the CTCs

The CEHC; the National Training Center (NTC) at Fort Irwin, California; and the Joint Improvised Explosive Device Defeat



Students become familiar with using the Buffalo's arm in a static environment before operating the arm from inside the vehicle.

(JIEDD) Task Force (TF) have teamed to form the Joint Center of Excellence for IED Defeat. The CEHC provides the individual and unit training on IED defeat equipment and techniques, while the NTC integrates these new capabilities into task force operations and validates emerging concepts in a joint and combined arms environment. The JIEDD TF evaluates these promising technologies and provides the resources required to enable the force. This team will be expanded to include all three CTCs and joint training centers.

Route Reconnaissance and Clearance Operations

The purpose of route reconnaissance and clearance operations is to detect and neutralize explosive hazards, thus protecting the force and providing commanders freedom of maneuver. Successful route reconnaissance and clearance requires the ability to improve or sanitize routes, a thorough knowledge of the route to detect changes, and the ability to safely neutralize explosive hazards. As the Army's lead for route reconnaissance and clearance, the CEHC has played a significant role in formalizing our doctrine and equipment sets currently used in theater and is forging ahead to test and validate new technologies to enhance the route clearance package. In addition, the CEHC has developed a course to train operators, mechanics, and leaders to conduct route reconnaissance and clearance operations. Since conception, this course has been attended by every deploying unit identified to conduct this mission in theater.

Military Search Operations

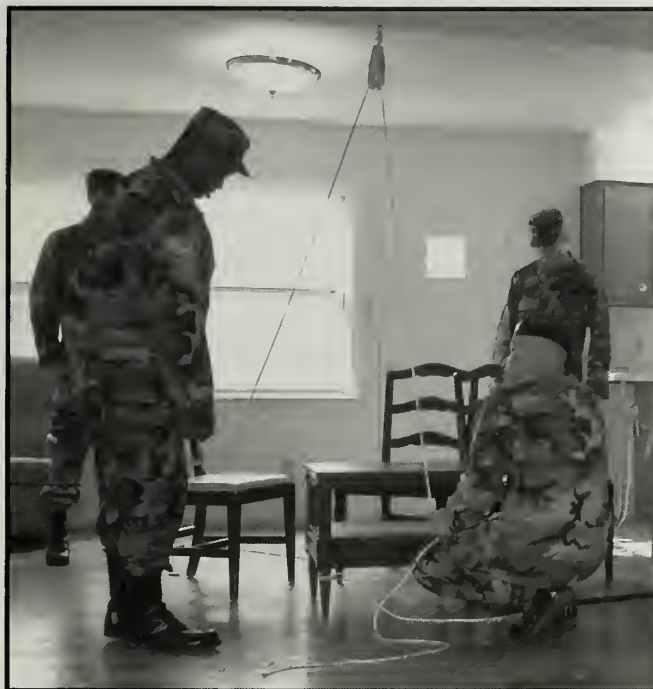
Military search is the application of systematic procedures at every level of command to locate specified targets in support of military or civil police operations. Specified targets include people, information, and materiel employed by an adversary. As the Army's lead for military search operations, the CEHC equips unit searchers and search advisors with a wide range of skills and tools that allow them to conduct person, vehicle, unoccupied and occupied building, and area searches, as well as manual route clearance. Emphasis is placed on conducting searches that stand up to legal scrutiny.

Enhanced Sapper Company Skills and Tools

Through intelligence-gathering efforts and analysis, the CEHC led an Engineer School team to identify means to increase the near-term capabilities of the brigade combat team (BCT) sapper company. Several innovative tools were identified to augment the reconnaissance capabilities, explosives, communications, and weapons already embedded in this vital sapper unit. The team also cross-walked the additional skills that unit leaders can obtain through existing courses (such as the Explosive Ordnance Clearance Agent, Urban Mobility Breaching, and Sapper Leader Courses) or new training in areas like special infrastructure assessment (sewage, water, electricity, academics, and trash [SWEAT]).

EOD/Engineer Integration

EOD and engineer units have unique and complementary roles regarding explosive hazards, and this necessitates close



Students are instructed in the use of remote pulling techniques where a high risk of booby traps exists.

coordination when operating in the COE. To better support assured mobility, EOD and engineer leadership recently changed the approach to IED neutralization in theater. Under certain situations, IEDs are designated as obstacles and can be breached (neutralized) by engineer companies. To provide this IED-neutralization capability to engineers, the CEHC has formed a liaison with the United States Army Ordnance Munitions and Electronic Maintenance School, Redstone Arsenal, Alabama, to develop a 2-week Improvised Explosive Device Breacher Course. This course will concentrate specifically on the interrogation of suspect devices and the remote neutralization of simple IEDs.

Engineer Robotics System

The change in the IED neutralization approach has led to the development of an engineer robotics system that allows IEDs to be interrogated and neutralized from a safe distance. The CEHC has investigated multiple robotic systems that meet theater requirements and is working fielding and training initiatives to rapidly increase capabilities in the force. The intent is to further enhance route clearance teams and sapper companies.

IED Defeat Information Management

Information management is a critical component of IED defeat. The CEHC is collecting, vetting, analyzing, organizing, and disseminating the myriad of information on this pertinent subject. The CEHC was instrumental in developing Field Manual Interim (FMI) 3-34.119, *Improvised Explosive Device Defeat*, published in September 2005. This interim manual made significant changes to a commander's doctrinal options for dealing with IEDs. The CEHC is transforming Field Manual

(Continued on page 16)



Constructing Landing Strip Hammer

Planning and Executing an Operation Iraqi Freedom Mission Readiness Project

By First Lieutenant Joseph Sahl

In December 2004, leaders of the 62d Engineer Battalion (Heavy) began coordinating with the Department of Public Works and the United States Air Force to make improvements to a landing strip—called Landing Strip Hammer—at Fort Hood, Texas. Used in the early 1990s, the landing strip was designed to handle C-130 aircraft. The improvements would allow C-17s, as well as other aircraft, to land there.

The Project

The 62d worked for more than eight months on the project, along with the 68th Engineer Company (Combat Support Equipment). The runway construction provided the perfect Operation Iraqi Freedom mission readiness opportunity to train on many critical battle tasks. The 68th was tasked to do most of the on-site construction with support from the 62d in the form of haul assets, some equipment, survey support, and a vertical construction unit from Alpha Company that built a tail wall for the culvert under the taxiway.

Phase I

Construction was divided into three phases. Phase I began in late January 2005 and involved clearing and grubbing the “maintained area,” which was more than 8.5 acres surrounding

the landing strip. The 68th removed obstacles (such as trees, shrubs, and rocks) that extended more than 6 inches above the existing grade. In the last weeks of the project, the area was graded again to remove new growth. Phase I also involved surveying the area to place initial boundary stakes for the runway and taxiway. The 68th then began removing the topsoil within the boundary stakes in order to remove any organics and ensure that there was room for 20 inches of quality fill and base material.

Unfortunately, February and March were the wettest months central Texas had experienced in quite some time, and there were fewer than ten days when this work could be done. The soil was so wet that any time heavy equipment was used, the site became messy and more work was often created. During these rainy weeks, the 62d’s equipment platoon began operating the borrow pit and hauled fill whenever the weather allowed. As topsoil was removed from the landing strip, many soft, wet spots were found, and initial estimates were increased. The round trip between the landing strip and the borrow pit took approximately one hour; fill became a valuable commodity. The original plan called for the equipment platoon to haul the fill and the 68th to emplace it during Phase II.



Soldiers using scrapers to remove the existing base to stockpile for later use

Phase II

Phase II involved compacting and grading the fill to bring the runway and taxiway within 6 inches of grade. Because the base was purchased, the plan was to be very deliberate with the fill to ensure that none of the base would be wasted. This made Phase II the toughest and definitely the longest phase, but it was beneficial when the base was placed on top.

As the weather cleared and the ground dried, it became apparent that the haul assets could not keep up with the equipment at the site due to the long turnaround time. What was hauled in a week could usually be placed within a day and a half, so the plan was adjusted to compensate. Most of the work at the site was halted as the 68th combined haul and personnel assets with the equipment platoon. They performed 24-hour haul missions for three weeks and hauled more than 35,000 cubic yards of fill. Once this stockpile was in place, work was resumed at the site. The fill, picked up by the scrapers and often pushloaded by the dozers, was laid down in 6-inch lifts. The lifts were compacted by high-speed soil compactors, and then the surveyors would test compaction with a nuclear densometer.

Portions of the existing runway were usable and had to be tied in to the new fill, so as fill was added to the new side, the existing runway was ripped up and combined with the new fill to ensure that crevices would not form later. While 1st and 3d Platoons, 68th Engineer Company, removed topsoil and compacted fill, the majority of 2d Platoon extended the culvert that ran underneath the taxiway. The old tail wall was destroyed and part of the taxiway was cut back so the old culvert pipe could be accessed. The additional 30-foot pipes were bound to the existing pipes and sealed. Then the Soldiers spent several days tamping the fill around the new culvert pipe extension until the rollers could be used. Alpha Company, 62d Engineer Battalion, built the forms and placed the concrete for a new tail wall later that month, and the culvert extension was completed.

Phase II was completed with the help of Bravo Company, 62d Engineer Battalion, who came from Fort Sill, Oklahoma,

for a battalion field training exercise. Also, Marines from the Marine Wing Support Squadron 473d spent more than a week working on the runway and helping to perform equipment maintenance. During this phase, Soldiers combined efforts to haul and then emplace more than 40,000 cubic yards of fill. The runway was raised as much as 9 feet in some places. The entire landing strip (including the runway, taxiway, and two turnarounds) was within 6 inches of the final grade. The longitudinal and transverse slopes were all well within the allowable slopes determined by the Air Force.

Phase III

Phase III involved compacting and grading the base over the fill to bring the landing strip up to final grade. The base, which had been stockpiled on top of the existing taxiway until it was ready to be used, was picked up by the scrapers and laid down in 4- to 6-inch lifts. The 68th used its smooth-wheel rollers to compact the base, along with two rented 9-wheel rollers to help with the final compaction.

Once the rain let up in March, there was almost no moisture for the rest of the project. The 68th used water distribution trailers behind M916 tractor trucks to bring in water. During the heat of the Texas summer, it became very challenging to keep the fill and base moist enough to meet compaction requirements. The 68th worked 24-hour operations for more than a month to keep the water coming. Light sets were used, and the Soldiers became proficient in operating their equipment at night. When optimal moisture content was reached, the fill and base reached compaction easily and the final phase moved quickly.

While final grading and compacting were conducted, other Soldiers worked to improve the drainage on the site. Ditches were dug on the outsides of the taxiway and runway to prevent water from settling on or near the landing strip. The ditches in between the runway and taxiway were connected to the culvert that went under the taxiway, and the water was routed out to a stock pond outside of the maintained area. The drainage was also improved along the access road—which has since been



Soldiers compact fill between the two culvert pipes they emplaced. The culvert will be used to drain water from the area between the runway and the taxiway. Water was directed from either end of the runway and channeled through this culvert into a retention pond outside of the maintained area.

renamed "Trailblazer Avenue" in recognition of the work done by the 68th Engineer Company "Trailblazers"—leading up to the landing strip.

Lessons Learned

Many hours went into planning, coordinating, and constructing Landing Strip Hammer, and lessons were taken from each aspect of the project. Most of the lessons learned were simply common sense reminders of the importance or precedence that some tasks took over others.

Planning Stage

Weekly meetings with the survey sections during the project allowed the surveyors to have a working knowledge of the project. A good initial survey and periodic quality control checks were essential to meet the timeline without any unnecessary delays or mistakes. In this case, several different survey teams were involved, and it was essential that they were all working with the same, most up-to-date data.

Cross Training and Licensing

One of the biggest benefits to the landing strip project was the cross training that the operators received. As the project progressed, more Soldiers became licensed and qualified on the various equipment, even if it was outside of their military occupational specialty. This gave the unit

the flexibility needed to meet expected construction demands in Iraq.

Conclusion

The Landing Strip Hammer project provided the 62d Engineer Battalion excellent training in preparation for Operation Iraqi Freedom. Officers, noncommissioned officers, and Soldiers benefited from planning, supervising, and constructing this landing strip.

Soldiers from the 62d, in addition to elements from the Marine Wing Support Squadron 473d, were involved in the construction. The runway was extended and widened, and the maximum slope was decreased. The taxiway was widened, the culvert extended, and a new tail wall was built. The mission was completed with an approximate savings of \$627,000 to the Army.

Maintaining Landing Strip Hammer will continue to provide a training benefit to engineer units at Fort Hood, and the landing strip will be a valuable training facility for the Army and other services for many years.



First Lieutenant Sahl is the executive officer for the 68th Engineer Company, 62d Engineer Battalion, 64th Corps Support Group, Fort Hood, Texas. He previously served as the 3d Platoon leader for 68th Engineer Company and was the officer in charge of the Landing Strip Hammer project. He holds a bachelor's from Texas A&M University and is a graduate of the Engineer Officer Basic Course.

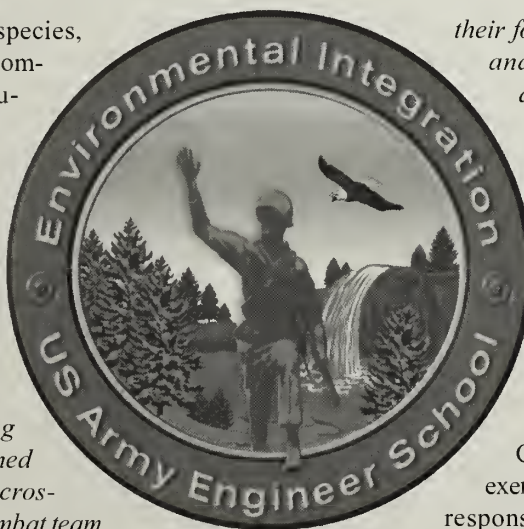


Environmental Considerations as Part of the Military Decision-Making Process

By Mr. Albert M. Vargenko

It is not just about endangered species, cleaning up spills, or being in compliance! Operations and simulations confirm that environmental considerations include many areas that might be low on the commander's (and staff's) priority list, but still need to be considered as part of the military decision-making process (MDMP).

Consider the following scenario: *U.S. deployed forces are about to conduct a deliberate river-crossing operation against a smart, determined but outnumbered, enemy. Multiple crossing sites are planned. One brigade combat team (BCT) will cross at a point in the river parallel to an underground petroleum pipeline. Not far away is an underground natural gas pipeline. Each one has exposed standpipes and valves on both sides of the river. The terrain is complex, with a mix of small built-up urban areas and rolling agricultural fields. Another BCT has a forward base established less than 1 kilometer away from a commercial phosphorus plant. A municipal power plant in the area of operations was destroyed by U.S. forces because the enemy was using it for hiding an antiaircraft battery. It is harvest season, and the farmers are trying to get their crops in before the rainy season starts. The U.S. mission is to destroy enemy forces, shore up the fledgling elected government and train*



their forces, and stay on to conduct stability and reconstruction operations (SRO) along with nation building. Winning the hearts and minds of the local population is an important implied task. Another key implied task is to conduct the mission with minimal casualties, both U.S. and civilian.

This was the scenario facing the United States Army Maneuver Support Center (MANSCEN) (Engineer, Military Police, and Chemical Schools) Captain's Career Course Warfighter III in their culminating exercise at the MANSCEN Battle Lab. Their responsibility was to address the environmental considerations.

- Environmental considerations should be clearly identified during the MDMP and the intelligence preparation of the battlefield (IPB). A thorough terrain analysis, to include identification of the existing infrastructure, would reveal that choosing a river-crossing site adjacent to these pipelines is not a good choice. These pipelines could be blown—either on purpose or by accidental artillery/mortar fires—and create a significant blast, illuminate the crossing sites, spill burning petroleum product in the river, and put the crossing at risk. Destruction of these pipelines would also have a significant adverse impact on the civilian population.

- Selecting a forward operating base so close to a commercial phosphorus plant is not a good idea in the interest of force health protection. The fumes from this plant could make Soldiers sick. If the plant were deliberately blown by the enemy, there could be significant loss of life (military and civilian) from toxic fumes carried downwind. The destruction of this plant would also adversely impact the farming community.
- Loss of the power plant may or may not affect combat operations, but in the aftermath of its destruction, a lot of time, money, and effort would be required to make it operational again. If destruction of the power plant is not absolutely necessary, it should not be targeted. The negative impacts of destroying the power plant should be weighed before the final decision is made to destroy it. There might be alternatives to reducing the enemy fire coming from the facility that do not require the plant's destruction.
- Since this is an agricultural area, there will be many feed stores in the area with agrochemicals present. These chemicals are easily made into explosive devices, which a determined and desperate enemy would employ. It would be an important priority in the offensive operation to secure these stores—to deny their use by the enemy and to protect them for future use by the agricultural community once combat ends.
- The farmlands, vineyards, orchards, and so on should be avoided to the extent that is militarily possible. Any follow-on SRO will be made simpler if the civilian population still has a means to make a living and stay employed. It might be necessary, as part of combat operations, to destroy some of the agriculture in the area, but the consequences would have to be addressed in the aftermath by the national government and the United States.

Other environmental considerations associated with military operations that can impact the operation include dust suppression, insect and/or vermin infestation, infectious-waste disposal, hazardous-waste disposal, and protection/preservation of historic, religious, and cultural sites.

For more information on environmental considerations during military operations, visit the United States Army Engineer School Directorate of Environmental Integration Web site at <www.wood.army.mil/dei>.

Mr. Vargesko is a doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) integration specialist with the United States Army Engineer School, Directorate of Environmental Integration, Fort Leonard Wood, Missouri. He received his environmental experience with the Missouri Department of Natural Resources. A retired lieutenant colonel, he holds a bachelor's in geography from the Indiana University of Pennsylvania and a master's in military art and science from the Command and General Staff College at Fort Leavenworth, Kansas.

("Counter Explosive," continued from page 11)



Students conduct a route reconnaissance and clearance operation.

(FM) 20-32, *Mine/Countermining Operations*, into FM 3-34.210, *Explosive Hazards Operations*, which is scheduled to be published in fiscal year 2006.

The CEHC developed an Improvised Explosive Device Defeat Train-the-Trainer (IEDD-T3) Course to enable trainers to prepare their units for the current IED threat. The training audience was recently expanded to include deploying units from all services. The CEHC conducts IEDD-T3 training at Fort Leonard Wood and via mobile training teams.

Summary

The CEHC has made dramatic progress over the past year, in both supporting the Global War on Terrorism and standing up an enduring Center of Excellence. CEHC initiatives have played a vital role in preparing units for operations in theater with emphasis on IED defeat. The center is focused on future needs, and systems are in place for continued progress to meet the needs of our force in the coming years. The CEHC will continue to market its capabilities to the field to enable the leadership to understand how these capabilities can be used to increase operational success and force protection.

Major Church is chief of the Countermeasures Division, CEHC, Fort Leonard Wood, Missouri. His previous assignments include two tours in Northern Ireland, bomb disposal officer for the 33d Engineer Regiment (EOD) with deployment operations to Kosovo and Bosnia, and second-in-command of an air support squadron in which he saw active service during the first six months of Operation Iraqi Freedom. He is a graduate of the Royal Military Academy Sandhurst.



United States Joint Forces Military Training Center Targets Deploying Units

By Major Michael J. Malone

The United States Joint Forces Military Skills Training Center, located at Fort Sam Houston, Texas, has shifted focus from international competition to training small units for deployment. Originally, the mission of the Center—operated by the United States Army Reserve Command—was to train U.S. Reserve officers, cadets, and midshipmen who had completed the Confédération Interalliée des Officiers de Réserve (CIOR)—(translated as Interallied Confederation of Reserve Officers) professional development course to compete in the annual North Atlantic Treaty Organization (NATO) CIOR Military Skills Competition, with the ultimate goal of winning a gold medal. But considering the ongoing training needs in support of the Global War on Terrorism, that goal no longer seemed adequate. Training for competition is now secondary to the mission of providing effective professional development and peak performance training in leadership and advanced military skills to small deploying units.

The Center reevaluated its end customer, deciding that the Department of Defense would be better served with well-trained, cohesive combat teams than with the prestige of winning the CIOR competition among our allies. The Center cadre is composed of Soldiers who are tops in their warfighting skills. The United States Army Reserve and United States Marine Corps Reserve marksmanship cadre include several who wear the President's Hundred Tab, which is awarded to the top 100 shooters each

year at the national shooting match at Camp Perry, Ohio. The lead land navigation instructor is a United States Navy Reserve SEAL officer who—because of his expertise—has been tasked with teaching land navigation skills to active duty Navy SEALs. Opening the curriculum to include pre-mobilization training for deploying teams seemed to be the logical next step.

The most recent beneficiary of this shift in mission focus was Facility Engineer Team (FET) 19, United States Army Facilities Engineering Group—Southwest, 416th Engineer Command. Scheduled to deploy to support base camps with engineer services and construction management, FET 19 underwent a 3-day team-building exercise at Camp Bullis, Texas. The exercise involved intensive training on the M9 pistol and M16A2 rifle, advanced land navigation, and combat first aid. The pistol and rifle training went beyond the engagement of static targets and focused on real-world decisions the Soldiers would be making in a deployment environment.

The training did not focus solely on warfighting skills, but integrated a constant theme of team building throughout. With facilitation from the Center cadre, the individual team members discussed their personal backgrounds and objectives for the deployment. In several subsequent sessions, the team had an opportunity to review higher-level command missions—from the commander in chief to the team's group commander. The culminating event was the development

of the team's mission statement—by the team—as it related to their upcoming deployment: *Deploy to the United States Army Central Command's area of responsibility and effectively provide quality facility engineering and engineer planning support to assist supported forces in the accomplishment of their mission.* This exercise will prove invaluable to the cohesiveness of the team as it continues its preparation for deployment.

Even though it's no longer the primary mission, the Center still trains selected Reserve officers to compete in the annual NATO CIOR Military Skills Competition. Approximately 160 Reserve officers and cadets from 19 NATO countries take part in the competition, which tests the competitors in warfighting skills such as rifle marksmanship, pistol marksmanship, orienteering/land navigation, land and water obstacle courses, combat first aid, and NATO policies (including the law of war) in a 3-day military competition. The competition not only provides international exposure to junior officers but also develops friendships and strengthens the NATO bond—which is an ideal way to foster cooperation between the various Reserve forces.

For more information, contact the United States Joint Forces Military Training Center at (210) 221-1206 or view its Web site at www.uscior.army.mil.



Major Malone is a civil engineer with the United States Army Facility Engineering Group—Southwest and will be deploying with FET 19.

USAES Deploys Katrina Recovery and Relief Support

By Major Jason Hedges, Royal Australian Engineer

In the wake of the devastation caused by Hurricane Katrina and Hurricane Rita, the United States Army Engineer School (USAES), Fort Leonard Wood, Missouri, responded to the United States Army Corps of Engineers® request for support within 24 hours. In September and October 2005, USAES deployed 21 volunteers—Team Katrina—to Louisiana and the surrounding regions. This was no easy task; among other things, orders had to be prepared and travel arrangements had to be made, to include finding available rental cars on short notice.

The volunteers—USAES faculty members, support staff, and students—were assigned to critical liaison or headquarters staff positions by the Corps. They were responsible for providing leadership and operational planning support. Upon arrival, Team Katrina personnel were deployed to almost every affected parish and immediately began to work alongside Corps of Engineers employees, local officials, state and federal agencies, and nongovernmental organizations to provide much-needed emergency support to citizens of the Gulf Coast. Many Team Katrina personnel were employed as liaison officers, facilitating valuable information flow between the Corps of Engineers and the local authorities. They also contributed significantly to the development of a common operational picture for Corps commanders. Their efforts

enabled the commanders to see, understand, and act as part of the overall emergency support function. As emphasized by a Team Katrina member serving as an assistant operations officer in the Louisiana Recovery Field Office, communication was the bottom line. He and other Team Katrina personnel held key headquarters positions to support the Corps's chain of command and kept information flowing.

Team Katrina personnel were exposed to the complexity of the interagency framework of large-scale disaster response operations. A captain serving as an operations officer with the Joint Field Office in Louisiana worked closely with the Federal Emergency Management Agency (FEMA). They accomplished many things, including setting up a fully functioning operations center within a week. This operations center tracked all recovery operations for the state of Louisiana, to include Operation Blue Roof (a free program that places temporary roofs of blue plastic sheeting on homes or facilities); debris removal; ice and water delivery; as well as meals, ready-to-eat (MRE) delivery. The liaisons from each parish reported real-time updates to the operations center.

The extent of the damage to New Orleans and the surrounding areas needed to be seen to be believed; the devastation was significant. Structural assessment, debris removal, and sanitation problems were the big issues faced.



Hurricane Katrina destroyed waterfront restaurants in Jefferson Parish. These two photos show the pier where they were once located.





Debris from the restaurants was pushed into a pile near the lake in Jefferson Parish.



A statue is the only surviving piece of this monument in Jefferson Parish.



Debris and wind damage were apparent in Old Metairie, Jefferson Parish.

The building in the background, located North of Interstate 10 in Jefferson Parish, had most of its windows blown out during the hurricane.





This is the site of the oldest house in New Orleans, built in the 1700s. It was completely destroyed by Hurricane Katrina.



Scattered debris was all that was left of a makeshift levee for Lake Ponchartrain.



President George W. Bush visited Louisiana to view the devastation in September while Team Katrina members were deployed. Also shown in the picture is the president of the Jefferson Parish Levee Board.



This is an Interstate 10 staging area for evacuations in Jefferson Parish.

Storm surges and levee failures caused by Hurricane Katrina, a Category 4 storm, left much of Orleans Parish flooded. Water poured through and over the levees. The 17th Street Canal—which separates Jefferson and Orleans Parish in New Orleans, Louisiana—experienced structural failures. The canal's levee was the site of one of the major levee breaches. When Hurricane Rita hit just twenty days later, levee repairs were not complete and some areas began to flood again.



These photos show flooding in the area adjacent to the 17th Street Canal.



This photo shows the breach in the 17th Street Canal levee.

Repairs were made to the 17th Street Canal, and some debris was removed.



Team Katrina personnel provided invaluable junior leadership focus to Corps of Engineers operations at the tactical level. The military uniform, regardless of branch or service, gave instant credibility and an expectation of leadership and agility. A task force was created to drain water from the area—Task Force Unwatering. One Team Katrina member who served as a liaison officer for the task force stated that the experts with the skills and techniques were brought together to execute the tasks. The task force operated temporary pumps, brought in sandbags and rock, and sealed breached areas in the levees.

Flooding occurred at City Stadium, Morgan City, Louisiana.



Pressure forced water up through this drain pipe.



This housing area near Lake Ponchartrain, Metairie, in East Orleans Parish, suffered extensive flood damage.



This car dealership in Plaquemine Parish was also flooded.



City Park in Orleans Parish was completely underwater.



These photos show some of the extensive damage at a Yacht Club in Orleans Parish.



This yacht was found three blocks away from the lake in Orleans Parish.

At the recent Army Engineer Association Engineer Regimental Conference, Lieutenant General Carl A. Strock, Chief of Engineers, praised the efforts of Team Katrina personnel. *"The team from the Engineer School provided exceptional support to the Corps of Engineers and made a significant difference to the people of the Gulf Coast."*

The decision by USAES to deploy Team Katrina generated numerous benefits. It proved to be an overwhelmingly positive experience, both professionally and personally. It exposed junior leaders to not only the Corps of Engineers but also to the vast array of governmental and nongovernmental agencies and organizations operating in a very complex framework to achieve humanitarian assistance on an unprecedented scale

within the United States. Team Katrina personnel also had a unique opportunity to directly assist their fellow Americans in a time of need.



Major Hedges is an exchange instructor and chief of the Engineer Captain's Career Course, United States Army Engineer School, Fort Leonard Wood, Missouri. A military representative of Australia, he is a graduate of the Royal Military College of Australia, Duntroon, and the Australian Command and Staff College. He holds a master's in project management and a master's in management and defence studies.

All photographs courtesy of Major John Espe.

A PICTURE IS WORTH A THOUSAND LIVES

By Dr. JoAnne Castagna

We've all seen the images of Hurricane Katrina's destruction—flooded streets, destroyed homes, shattered families. It's these same images that are helping rebuild the lives of our fellow Americans in the Gulf Coast.

More than 1,600 United States Army Corps of Engineers (USACE) employees are supporting the Federal Emergency Management Agency (FEMA) and other state, federal, and volunteer agencies in the recovery efforts throughout Mississippi and Louisiana (see Figure 1). But before the recovery efforts could begin, the region needed to be mapped out. The hurricane had blown away most of the street signs, so rescue and recovery teams had no idea what streets they were on.

USACE uses a geographic information system (GIS)—a computer-based information system and analytical tool—to create the necessary maps. According to one of the three USACE action officers who are responsible for deploying and managing GIS teams throughout the disaster region, the GIS takes data from various sources—including aerial

photography, flood zones, and demographic data—and combines these layers of information in various ways as overlays to perform spatial analysis and produce a map that depicts the results of that analysis.

USACE uses GIS images in performing the following recovery efforts:

- **Assessing post-disaster damage.** To assess damage, maps are created of the entire region. First, aerial photos are taken of the region and then are laid over geographic coordinates. This information is brought into a computer mapping system to create a map.
- **Rescuing and recovering.** The GIS teams gather data on where hurricane victims are located and feed this information into the GIS database. This data is combined with the aerial photography and other geographic data to produce maps that search-and-rescue workers can use to locate and recover stranded individuals.
- **Building temporary homes.** Temporary housing is only allowed to be developed on land that is not prone to

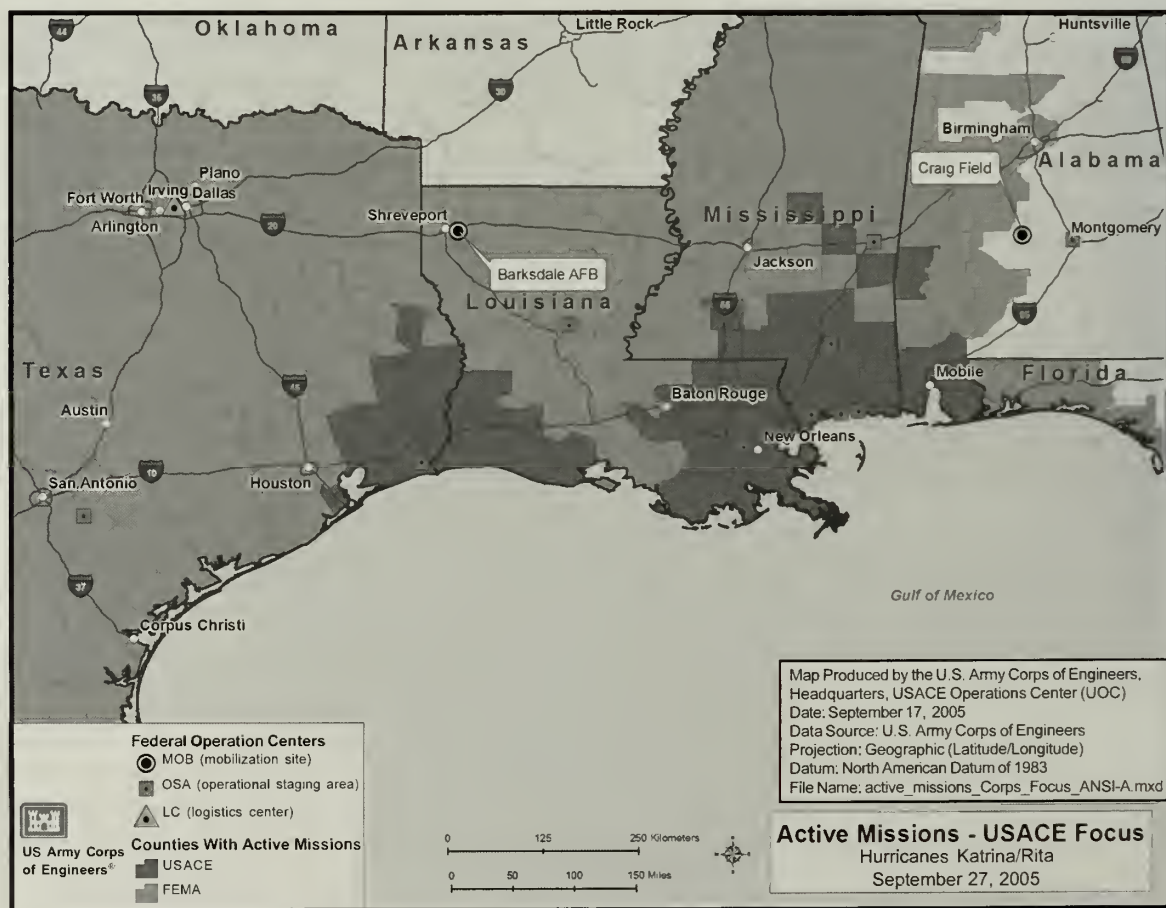


Figure 1. Active Missions

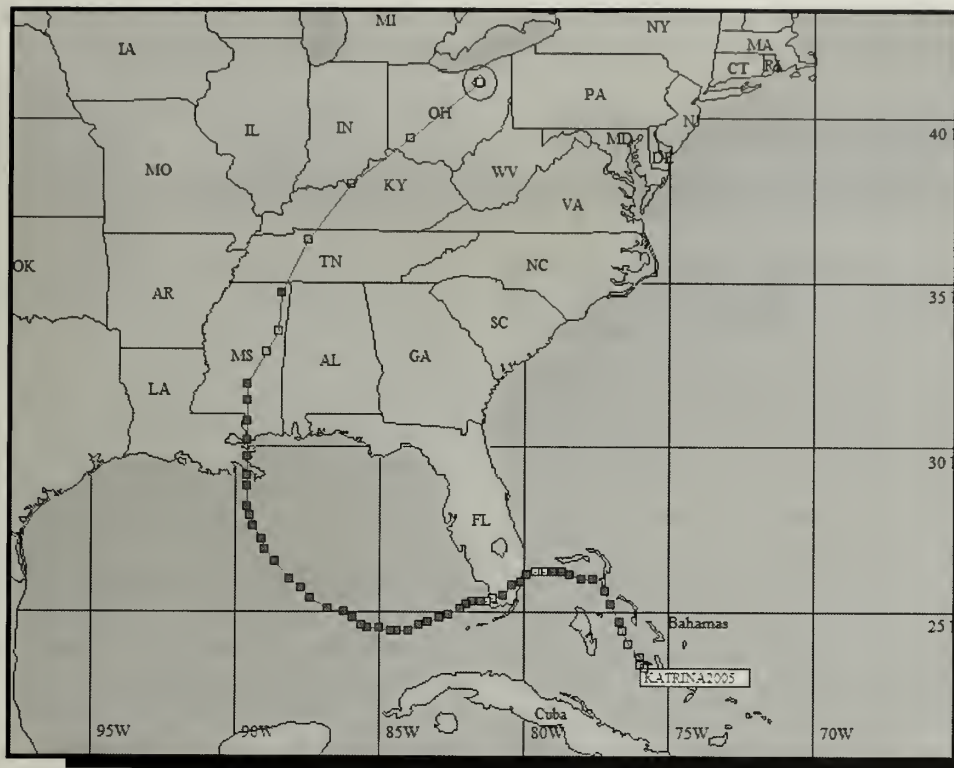


Figure 2. Katrina's Path

flooding, is safe, and is in the proximity of services such as hospitals and schools. Data on the flood zones is combined with other data types to produce maps that show the best locations for temporary housing.

- **Removing debris.** The GIS maps show engineers where debris is located. Engineers can calculate how much debris there is from these maps and determine how much it would cost to remove it. These maps also show where the land is clear. Clear land is needed for "staging areas" to hold the equipment that will be used to remove the debris. In addition, GIS maps show engineers the optimal routes for removing and transporting the debris.
- **Pumping floodwater.** The GIS can perform three-dimensional (3-D) analysis and modeling that shows how long it will take for floodwaters to subside, using different rates of pumping. In addition, GIS teams in the field can provide data about where pump stations are located and which ones are working and not working. This data was used to help calculate how long it would take to pump water out of the region.
- **Identifying impacted communities.** The GIS can be used to create demographic maps that identify what economic and racial groups are impacted the most. These maps are created by combining hurricane path data with the aerial images, wind speed data, and census data (see Figure 2). These maps are used by various groups involved in the rescue-and-recovery efforts, including the American Red Cross.

GIS mapping is one of several tasks that must be initiated immediately when acting on a disaster relief situation. Communicate, coordinate, and cooperate are the three essential

Cs for getting things going and accomplishing what is needed in a short amount of time in disaster situations. Following are suggestions for engineers who are faced with initiating a disaster relief mission:

- **Plan ahead.** Have a strategy in place before a disaster occurs.
- **Create a team of diversified specialists.** Many of the GIS team members are non-GIS specialists who come from other disciplines. These other additional skills can combine to meet the many needs during a disaster.
- **Organize and utilize available resources.** USACE needed to take aerial photography of the disaster and was able to immediately call on a contractor to perform that work.
- **Keep lines of communication open.** USACE worked closely with other agencies, and the working relationship was great, due to their frequent communication. One GIS team leader had two teleconference meetings with FEMA and other federal and state agencies daily.

There are a variety of ways that the GIS can be used to help support disaster missions. A picture is worth a thousand words, and if that picture has a lot of useful information on it, people can relate to it.



Dr. Castagna is a technical writer/editor for the United States Army Corps of Engineers, New York District. She writes about the district's diversified civil and military projects and studies and has been published in more than 50 national and international publications. In 2004, her writing received accolades from the Department of the Army.

***Military Review* Seeks Essays for 2006 Professional Military Writing Competition**



For the 2006 General William E. DePuy Professional Military Writing Competition, *Military Review* seeks original essays on subjects of current concern to the United States Army. This contest is open to all. The Global War on Terrorism, evolving threats, force reform, insurgency/counterinsurgency, cultural awareness in military operations, tanks in urban combat, transitioning from combat to stability and reconstruction operations, ethical challenges in counterinsurgency, historical parallels to current operations, better ways to man the force—the possible topics are limitless. Winning papers will be carefully researched, analytically oriented critiques, proposals, or relevant case histories that show evidence of imaginative, even unconventional, thinking. Submissions should be 3,500 to 5,000 words long.

First prize is featured publication in the May-June 2006 edition of *Military Review*, a \$500 honorarium, and a framed certificate. Second and third prizes offer publication in *Military Review*, a \$250 honorarium, and a certificate. Honorable mention designees will be given special consideration for publication and certificates.

Essays should be submitted with an enrollment form not later than 1 April 2006 to *Military Review*, ATTN: Competition, 294 Grant Avenue, Fort Leavenworth, Kansas 66027-1254, or via e-mail to <milrevweb@leavenworth.army.mil> (Subject: Competition). For a copy of the enrollment form and additional information, visit *Military Review*'s Web site at <<http://www.leavenworth.army.mil/milrev/>>.

..... *The Engineer Writer's Guide*

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in Powerpoint®. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of your past assignments, experience, and education; your

mailing address; and a fax number and commercial daytime telephone number.

Articles submitted to *Engineer* for publication must be accompanied by a written release from the author's unit or activity security manager. All information contained in the article must be unclassified, nonsensitive, and releasable to the public. *Engineer* is distributed to military units worldwide and is also available for sale by the Government Printing Office. As such, it is readily accessible to nongovernment or foreign individuals and organizations.

We cannot guarantee that we will publish all submitted articles. They are accepted for publication only after thorough review. If we plan to use your article in an upcoming issue, we will notify you. Therefore, it is important to keep us informed of changes in your e-mail address or telephone number. All articles accepted for publication are subject to grammatical and structural changes as well as editing for style.

Send submissions, in Microsoft® Word, by e-mail to <engineer@wood.army.mil> or send a 3 1/2-inch disk or a CD, along with a double-spaced copy of the manuscript, to: Managing Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 348, Fort Leonard Wood, Missouri 65473-8929.

Note: Please indicate if your manuscript is being considered for publication elsewhere. Due to the limited space per issue, we usually do not print articles that have been accepted for publication by other Army professional bulletins.



NGA SUPPORTS CGSC

"NGA provides significant capabilities and expertise in terrain visualization and digital imagery as we push our students to fully analyze the available data so that they can make better command decisions in the heat of battle."

*LTC(R) Jonathan M. Williams
Instructor, Center for Army Tactics
Command and General Staff College*

By Mr. Ralph M. Erwin and Ms. Marsha M. Mocaby

The National Geospatial-Intelligence Agency (NGA) is an integral part of the education process of joint military exercises at the Army's Command and General Staff College (CGSC), Fort Leavenworth, Kansas. For the past four years, the NGA Support Team-Army (NST-A) and NGA Production and Analysis Directorate's EurAsia/Africa Office (PE) have supported the annual division-level exercise. This past April, ten NST-A and PE analysts were directly engaged with students in their staff groups during the execution phase of the simulation-driven exercise.

Concept

CGSC has developed an intermediate-level education (ILE) concept for midcareer military officers. This concept provides for an ILE common-core course followed by an advanced applications program. The focus of

the ILE common-core course is to teach about the joint, interagency, and multinational operational warfighting environment. During the ILE common-core course, NGA is introduced as a Department of Defense combat support agency and a member of the United States intelligence community. Following the core course, CGSC students continue into the advanced applications program, which focuses on their immediate follow-on duty requirements. During the advanced applications program, NGA is integrated into the curriculum for space applications, military intelligence, and joint planner courses.

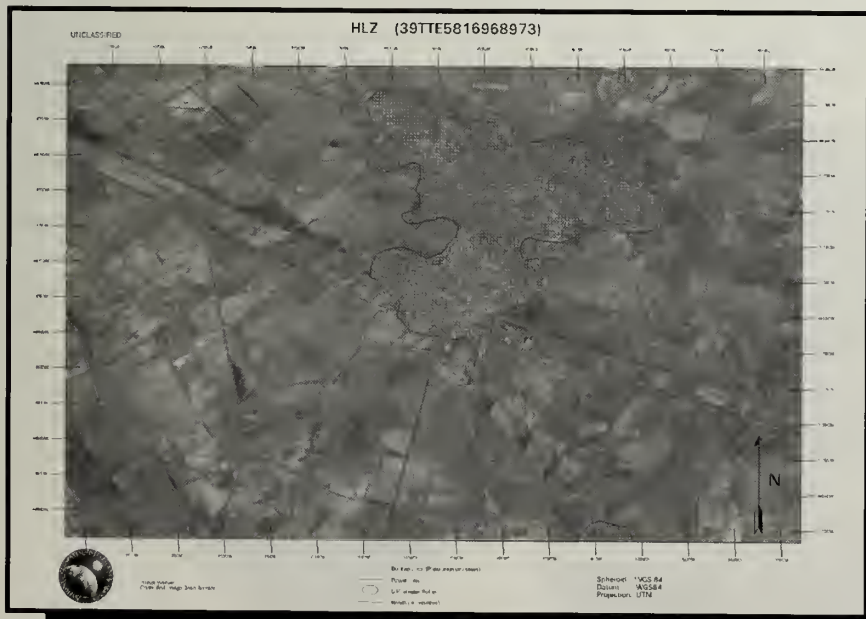
Collaboration

The collaboration between NGA and the CGSC has been unique and challenging for both the professional analysts and the military students. By integrating NGA

geospatial intelligence and imagery analysts into the classrooms, students gained an information edge on mission analysis and decision-making processes. In turn, the NGA analysts were able to see directly how geospatial intelligence was used to achieve military objectives based on warfighter battlespace visualization requirements. Students submitted requests for information that guided the analysis by the NGA professionals. Analysts generated standard and nonstandard geospatial intelligence products for CGSC students.

The student decision makers in this year's exercise were provided with relevant, accurate, predictive, and actionable geospatial intelligence. The instructors and students achieved a reliable understanding of the battlespace by integrating specific geospatial

(Continued on page 29)



The CGSC Tactics Cell built a geo-intelligence product to support a hostage evacuation operation. (Space Imaging® LLC-purchased ClearView licensed imagery.)

A Project of Patience

By Mr. Paul W. Dobie and Lieutenant Colonel Vicki Flack

In June 2005, we were serving as the facilities engineer and the construction engineer with the United States Army Materiel Command (AMC) Field Support Battalion in Bagram, Afghanistan. The battalion needed state-of-the-art field maintenance and base camp facilities constructed to support their mission and faced the challenge of making this happen in a land of unique, perplexing, and almost insurmountable barriers. These facilities not only would provide the workplace for all maintenance and administrative functions but also would house the entire workforce. They were to be government-owned, contractor-operated facilities.

AMC Construction Project

An aggressive AMC construction project evolved to provide the backbone of support to the Soldiers. However, throughout the construction effort, significant challenges had to be dealt with, such as the lack of Western standards, multiple contractors, the quality of work, local holidays, timelines, mission priorities, security and force protection issues, transportation issues, and dust storms. In Iraq, the response to getting something done was often “two weeks.” In Afghanistan, it was “two weeks, but with patience.”

Sprungs Into Action

Sprung Instant Structures—which resembled large Bedouin tents with ribs—had been chosen as the solution to the facilities issue. Constructed of extruded aluminum arches, a Sprung

structure is integrally connected to an all-weather outer membrane and engineered to withstand high winds. The first Sprung structure was already up and was providing a workplace for the Soldiers. The framework was established and the concrete was in place for the remaining three structures, which were scheduled to be completed by 31 August. Patience soon became a necessary commodity as construction continued on this major project—an underlying priority in the midst of vehicle upgrade and maintenance, which were the primary missions.

Combined Task Force Sword Support

The construction project matured with assistance from Combined Task Force Sword engineers. The task force included a group of Korean engineers, who went into full swing, placing concrete for the life support area, the office complex, the wash rack facility, the paint booth foundation, and a knee wall for a K-Span building. The Korean team placed more than 3,300 cubic meters of concrete. Troop construction support continues from Headquarters, 18th Engineer Brigade, and a detachment of Polish engineers.

Life Support Area

In conjunction with the major construction effort to support mission requirements was a “mini base camp” or life support area, which provided significant improvements in the living conditions in Bagram, over the existing base camp huts (B-huts) and tents. Originally estimated for completion at the end of July, the unique Afghanistan transportation challenges delayed delivery of all materials until early September. With Murphy’s Law an active participant, the infrastructure that supports the living units was a true project of patience.

The construction of the base camp was a team effort of contractors, coalition engineers, and AMC. Despite weather conditions that brought severe dust storms, solving problems and doing things right was the daily routine. We met our goal of having the workforce living on-site before Christmas, while continuing to be flexible in supporting mission requirements.



Skeleton ribs of a relocatable Sprung Instant Structure



Living container assembly—a jigsaw puzzle at its best

Conclusion

The statement “mission first” has been the mainstay of the engineering and construction effort in Bagram. The battalion commander instilled in the unit his philosophy to “support the Soldier by serving the Soldier, protecting the Soldier, and sustaining the Soldier.” The construction project, which created maintenance and base camp facilities in a barren wasteland, was a project of patience and a credit to the effective use of combined joint task force engineering assets, while utilizing both international and local contractors. It is a success story for AMC and for Operation Enduring Freedom.



Mr. Dobie is a civil engineer with Lockheed Martin Information Technology, Sytex Business Unit. He previously served with the United States Army Corps of Engineers for 30 years, with significant experience in response operations and program management. He is a graduate of Old Dominion University, Norfolk, Virginia.

Lieutenant Colonel Flack, an engineer officer, serves as the executive officer and construction engineer for the AMC Field Support Battalion, Bagram, Afghanistan. She is a graduate of the United States Military Academy.



(“NGA Supports CGSC,” continued from page 27)

intelligence data sets, expert analysis, and visualization tools (such as the Maneuver Control System-Light and NGA’s FalconView™.)

Recommendations

To continue enhancing the CGSC curriculum and incorporate NGA’s intelligence preparation of the environment (IPE), the following will be addressed:

- Integrating NGA regional, geospatial intelligence, and imagery analysts into the mission-planning phase of CGSC exercises.
- Engaging a terrain team-like capability sponsored by the United States Army Engineer School, United States Army Training and Doctrine Command (TRADOC) Program Integration Office—Terrain Data (TPIO-TD).
- Increasing instructor and student awareness about NGA support and capabilities during the entire education process.
- Identifying anticipated geospatial intelligence and IPE products for battlespace visualization, mission analysis, and decision making to support the exercise.
- Increasing the insertion of mobile training teams and train-the-trainer sessions led by the NGA Defense Geospatial-Intelligence School.
- Identifying how imagery analysis and exploitation (as part of the imagery intelligence cycle) can be incorporated as part of the exercise simulation during the ILE core course and advanced applications program.
- Incorporating knowledge bases and understanding of different human behavioral patterns, cultures, regions, and societal influences necessary for stabilization, reconstruction, and humanitarian support missions into the ILE core course and advanced applications program.

Conclusion

The NST-A and PEs have been successful in demonstrating NGA’s core competencies at the Army’s CGSC. They have been an integral part of the education process during the ILE core course and advanced applications program. Continued collaboration with the CGSC will enhance the skills of NGA analysts and the decision making of these military leaders.



Mr. Erwin is the NGA Staff Officer to the United States Army Training and Doctrine Command. He is a graduate of the Army War College and holds a bachelor’s from Cameron University, Oklahoma.

Ms. Mocaby is a Senior Geospatial Analyst with the NGA EurAsia/Africa Office. She holds a bachelor’s in geology and cartography from Southern Illinois University.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since March 2003. We dedicate this issue to them.

Name	Unit	Location
Adams, Private Algernon	122d Engineer Battalion	Graniteville, South Carolina
Adams III, Specialist Clarence	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Allen, First Lieutenant Louis E.	42d Infantry Division	Troy, New York
Arnold Sr., Sergeant Larry R.	150th Engineer Battalion, 155th Brigade Combat Team	Lucedale, Mississippi
August, Captain Matthew J.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Ayro, Private First Class Lionel	1st Brigade, 25th Infantry Division	Fort Lewis, Washington
Barbret, Private First Class Mark A.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Barnett, Second Lieutenant Christopher W.	1st Battalion, 256th Brigade Combat Team	Shreveport, Louisiana
Biskie, Sergeant Benjamin W.	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Boatright, Sergeant Michael L.	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Bossert, Sergeant Andrew L.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Bowen, Specialist Samuel R.	216th Engineer Battalion	Hamilton, Ohio
Bradley, Staff Sergeant Kenneth R.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Brinlee, Specialist Kyle A.	120th Engineer Battalion	Pryor, Oklahoma
Brooks, Sergeant Cory W.	153d Engineer Battalion	Winner, South Dakota
Brown, Specialist Philip D.	141st Engineer Battalion	Jamestown, North Dakota
Bunch, Specialist Joshua I.	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Byers, Specialist Casey	224th Engineer Battalion	Ottumwa, Iowa
Caradine Jr., Specialist Ervin	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Carroll, Specialist James D.	230th Engineer Battalion	Mckenzie, Tennessee
Carter, Specialist Justin B.	1st Battalion, 3d Infantry Division	Fort Benning, Georgia
Castro, Specialist Jonathan	1st Brigade, 25th Infantry Division	Fort Lewis, Washington
Chan, Specialist Doron	411th Engineer Brigade	Windsor, New York
Chance III, Specialist James A.	890th Engineer Battalion	Columbia, Mississippi
Cheatham, Private First Class Jonathan M.	489th Engineer Battalion	Camden, Arkansas
Christensen, Staff Sergeant Thomas W.	652d Engineer Company, 88th Regional Readiness Group	Ellsworth, Wisconsin
Cleary, First Lieutenant Michael J.	1st Battalion, 3d Infantry Division	Fort Benning, Georgia
Coles, Sergeant Dominic R.	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Cooley, Sergeant First Class Sean M.	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Corral, Sergeant Dennis A.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Creamean, Specialist Tyler L.	1st Brigade, 25th Infantry Division	Fort Lewis, Washington
Davis, Private Brandon L.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Davis, Specialist Raphael S.	223d Engineer Battalion	Calhoun City, Mississippi
Davis, Specialist Robert G.	864th Engineer Battalion, 555th Maneuver Enhancement Brigade	Fort Lewis, Washington
Diaz, First Lieutenant Carlos J.	2d Battalion, 3d Infantry Division	Fort Benning, Georgia
Dill, Staff Sergeant Christopher W.	2d Brigade, 98th Division	Pennsauken, New Jersey
Dima, Sergeant Catalin D.	411th Engineer Brigade	New Windsor, New York
Dostie, Specialist Thomas J.	133d Engineer Battalion	Portland, Maine
Drexler, Private Jeremy L.	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Eckert Jr., Sergeant Gary A.	983d Engineer Battalion	Monclova, Ohio
Esposito, Captain Phillip T.	42d Infantry Division	Troy, New York

Name	Unit	Location
Evans II, Specialist Michael S.	1088th Engineer Battalion, 256th Brigade Combat Team	New Roads, Louisiana
Falaniko, Private Jonathan I.	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
Farrow, Staff Sergeant Jeffery J.	146th Quartermaster Company	Fort Totten, New York
Faulkner, Sergeant James D.	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Fettig, Specialist Jon P.	957th Engineer Company	Bismarck, North Dakota
Forbes, Specialist Aaron M.	1st Battalion, 4th Infantry Division	Fort Hood, Texas
Franklin, Private First Class Michael W.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Gabrielson, Sergeant First Class Dan H.	652d Engineer Company, 88th Regional Readiness Group	Ellsworth, Wisconsin
Garceau, Specialist Seth K.	224th Engineer Battalion, 155th Brigade Combat Team	Burlington, Iowa
Gaunky, Private First Class Anthony A.	3d Brigade Special Troops Battalion, 101st Airborne Division	Fort Campbell, Kentucky
Gelineau, Specialist Christopher D.	133d Engineer Battalion	Gardiner, Maine
Gibbs, Private First Class Mathew V.	648th Engineer Battalion, 48th Infantry Brigade	Statesborough, Georgia
Gienau, Second Lieutenant Richard B.	224th Engineer Battalion	Burlington, Iowa
Gilman, Sergeant Benjamin L.	41st Engineer Battalion, 10th Mountain Division	Fort Drum, New York
Goldberg, Specialist David J.	52d Engineer Battalion, 43d Area Support Group	Fort Carson, Colorado
Haight, Specialist Charles G.	14th Engineer Battalion, 555th Combat Engineer Group	Fort Lewis, Washington
Hall Jr., Specialist Robert E.	467th Engineer Battalion	Greenwood, Mississippi
Hattamer, Staff Sergeant Stephen C.	652d Engineer Company, 88th Regional Readiness Group	Ellsworth, Wisconsin
Hawkins II, Staff Sergeant Omer T.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Hendrickson, Staff Sergeant Kenneth W.	957th Engineer Company, 130th Engineer Brigade	Bismarck, North Dakota
Hodge, Sergeant Jeremy M.	612th Engineer Battalion	Tiffin, Ohio
Hoffman, Sergeant First Class James T.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Hollinsaid, Staff Sergeant Lincoln D.	11th Engineer Battalion, 3d Infantry Division	Fort Stewart, Georgia
Holmes, Specialist James J.	141st Engineer Battalion	Hettinger, North Dakota
Hoyer, Private First Class Bert E.	652d Engineer Company, 88th Regional Readiness Group	Ellsworth, Wisconsin
Hubbell, Specialist Cory A.	46th Engineer Battalion	Fort Rucker, Alabama
Hufstедler, First Lieutenant Doyle M.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Hurley, First Lieutenant Joshua C.	326th Engineer Battalion, 101st Airborne Division	Fort Campbell, Kentucky
Huxley Jr., Private Gregory P.	317th Engineer Battalion	Fort Benning, Georgia
Jackson, Specialist Marlon P.	94th Engineer Battalion, 130th Engineer Brigade	Vilseck, Germany
Jodon, Sergeant Andrew R.	3d Battalion, 3d Infantry Division	Fort Stewart, Georgia
Johnson, Private First Class Rayshawn S.	299th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Jones, Sergeant First Class Michael D.	133d Engineer Battalion	Belfast, Maine
Jordan Jr., Specialist Curt E.	14th Engineer Battalion, 555th Combat Engineer Group	Fort Lewis, Washington
Kading, Sergeant First Class Matthew R.	983d Engineer Battalion	Monclova, Ohio
Karr Jr., Specialist Michael G.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Kimbrough, Lieutenant Colonel Paul Wayne	416th Engineer Command	Darien, Illinois
Kiser, Sergeant Timothy C.	340th Forward Support Battalion, 40th Infantry Division	Red Bluff, California
Koch, Specialist Matthew A.	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
Koenig, Staff Sergeant Lance J.	141st Engineer Battalion	Jamestown, North Dakota
Landrus, Staff Sergeant Sean G.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Lawton, Staff Sergeant Mark A.	244th Engineer Battalion	Grand Junction, Colorado
Longstreth, Private First Class Duane E.	307th Engineer Battalion, 82d Airborne Division	Fort Bragg, North Carolina
Lutters, Specialist Derrick J.	891st Engineer Battalion	Pittsburg, Kansas
Mahlenbrock, Specialist David P.	65th Engineer Battalion, 25th Infantry Division	Schofield Barracks, Hawaii
Manzano, Private First Class Pablo	54th Engineer Battalion, 130th Engineer Brigade	Bamberg, Germany
Martin, Private First Class Ryan A.	216th Engineer Battalion	Hamilton, Ohio
Mason, Specialist Nicholas C.	276th Engineer Battalion	West Point, Virginia
McCaffrey Sr., Specialist Patrick R.	579th Engineer Battalion	Petaluma, California

Name	Unit	Location
McNail, Specialist Robert A.	150th Engineer Battalion, 155th Armor Brigade	Lucedale, Mississippi
Menyweather, Staff Sergeant Eddie E.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Meyer, Private First Class Jason M.	11th Engineer Battalion, 3d Infantry Division	Fort Stewart, Georgia
Miller, Corporal John W.	224th Engineer Battalion	Burlington, Iowa
Millsap, First Sergeant Timothy J.	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
Mitchell, Sergeant Keman L.	4th Engineer Battalion, 4th Infantry Division	Fort Carson, Colorado
Mitchell, Specialist Sean R.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Monta, Sergeant Ruth S.	1st Battalion, 3d Infantry Division	Fort Benning, Georgia
Moothart, Sergeant Travis A.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Moreno, Specialist Jaime	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Morgan, Specialist Dennis B.	153d Engineer Battalion	Winner, South Dakota
Murray, Sergeant David J.	1088th Engineer Battalion, 256th Brigade Combat Team	New Roads, Louisiana
Nakis, Specialist Nathan W.	52d Engineer Battalion	Fort Carson, Colorado
Naputi, Specialist Richard Junior D.	1st Battalion, 3d Infantry Division	Fort Benning, Georgia
Neusche, Specialist Joshua M.	203d Engineer Battalion	Joplin, Missouri
Nieves, Specialist Isaac M.	82d Engineer Battalion, 1st Infantry Division	Bamberg, Germany
Norquist, Specialist Joseph C.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Nurre, Sergeant Joseph C.	463d Engineer Battalion	Weirton, West Virginia
Ojeda, Specialist Ramon C.	84th Engineer Battalion, 25th Infantry Division	Schofield Barracks, Hawaii
Ottolini, Staff Sergeant Michael C.	579th Engineer Battalion	Petaluma, California
Palacios, Specialist Gabriel T.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Paliwoda, Captain Eric T.	4th Engineer Battalion, 4th Infantry Division	Fort Carson, Colorado
Pankey Jr., Sergeant Larry W.	467th Engineer Battalion	Greenwood, Mississippi
Parker, Private First Class James D.	588th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas
Parker, Private First Class Kristian E.	205th Engineer Battalion	Slidell, Louisiana
Penamedina, Staff Sergeant Abraham D.	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Pinkston, Sergeant Foster	878th Engineer Battalion	Augusta, Georgia
Pintor, Captain Dennis L.	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Poulin Sr., Sergeant Lynn R.	133d Engineer Battalion	Belfast, Maine
Preusse, Corporal Randall D.	386th Engineer Battalion, 278th Regimental Combat Team	Austin, Texas
Ramsey, Specialist Christopher J.	1088th Engineer Battalion, 256th Brigade Combat Team	New Roads, Louisiana
Raney, Private First Class Cleston C.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Reed, Staff Sergeant Jonathan R.	1088th Engineer Battalion, 256th Brigade Team	New Roads, Louisiana
Reyes, Sergeant Luis R.	947th Engineer Company	Durango, Colorado
Reyna, Private First Class Seferino J.	70th Engineer Battalion, 1st Armored Division	Fort Riley, Kansas
Rodriguez, Staff Sergeant Joseph E.	8th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Rooney, Sergeant First Class Robert E.	379th Engineer Company	Nashua, New Hampshire
Ruhren, Specialist David A.	276th Engineer Battalion	West Point, Virginia
Rusin, Private First Class Aaron J.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Rymer II, Specialist Lyle W.	239th Engineer Company, 39th Infantry Brigade	Fort Chaffee, Arkansas
Seesan, First Lieutenant Aaron N.	1st Brigade, 25th Infantry Division	Fort Lewis, Washington
Smette, Sergeant Keith L.	957th Engineer Company, 130th Engineer Brigade	Bismarck, North Dakota
Smith, Sergeant First Class Paul R.	11th Engineer Battalion, 3d Infantry Division	Fort Stewart, Georgia
Soelzer, Captain Christopher F.	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Splinter, Major Christopher J.	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Strange, Private First Class William R.	91st Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Tobler, Specialist Brandon S.	671st Engineer Company	Portland, Oregon
Trevithick, Specialist Richard K.	9th Engineer Battalion, 1st Infantry Division	Schweinfurt, Germany
Tyrrell, Private Scott M.	299th Engineer Battalion, 4th Infantry Division	Fort Hood, Texas

Name	Unit	Location
Tyson, Second Lieutenant Andre D.	579th Engineer Battalion	Petaluma, California
Unruh, Specialist Robert Oliver	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Vargas-Medina, Staff Sergeant Oscar	84th Engineer Battalion, 25th Infantry Division	Schofield Barracks, Hawaii
Villanueva, Sergeant First Class Joselito O.	9th Engineer Battalion, 1st Infantry Division	Schweinfurt, Germany
Walker, First Lieutenant Laura M.	864th Engineer Battalion, 555th Maneuver Enhancement Brigade	Fort Lewis, Washington
Ward, Private First Class Andrew M.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Warren, Staff Sergeant Charles H.	648th Engineer Battalion, 48th Infantry Brigade	Statesborough, Georgia
Washington, Specialist Bennie J.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Webb, Sergeant Charles J.	82d Engineer Battalion, 1st Infantry Division	Bamberg, Germany
Weger, Specialist Michael S.	20th Engineer Battalion, 1st Cavalry Division	Fort Hood, Texas
Wentz, Specialist Cody L.	141st Engineer Battalion	Williston, North Dakota
White III, Private Robert C.	864th Engineer Battalion, 555th Maneuver Enhancement Brigade	Fort Lewis, Washington
Widner, Specialist Vernon R.	3d Brigade Special Troops Battalion, 101st Airborne Division	Fort Campbell, Kentucky
Wilkins III, First Lieutenant Charles L.	216th Engineer Battalion	Hamilton, Ohio
Williams IV, Sergeant Arthur C.	44th Engineer Battalion, 2d Infantry Division	Camp Howze, Korea
Wolf, Specialist James R.	52d Engineer Battalion	Fort Carson, Colorado
Wood, Sergeant Brian M.	9th Engineer Battalion, 1st Infantry Division	Schweinfurt, Germany
Wright, Specialist Brian A.	135th Engineer Company	Lawrenceville, Illinois

Regimental Awards

Each year, we recognize the best engineer company, lieutenant, noncommissioned officer, and enlisted Soldier—in each of the components—for outstanding contributions and service to our Regiment and Army. Every engineer unit in the Regiment can submit the name and achievements of its best of the best to compete in these distinguished award competitions. Only the finest engineer companies and Soldiers are selected as recipients of these awards. The Soldiers will carry throughout their careers the distinction and recognition of being the Engineer Branch's best and brightest Soldiers and leaders. Following are the results of the 2004 selection boards for the Itschner and Outstanding Engineer Platoon Leader (Grizzly) Awards, the Sturgis Medal, and the Van Autreve Award:

Active Army

Itschner Award: Alpha Company, 20th Engineer Battalion (Combat), 1st Cavalry Division, Fort Hood, Texas.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Gary P. McDonald, Charlie Company, 20th Engineer Battalion (Combat), 1st Cavalry Division, Fort Hood, Texas.

Sturgis Medal: Staff Sergeant Scott Smullen, Charlie Company, 27th Engineer Battalion, Fort Bragg, North Carolina.

Van Autreve Award: Corporal Whitney Taylor, Alpha Company, 2d Engineer Battalion, Camp Castle, Korea.

United States Army Reserve

Itschner Award: Detachment 2, 854th Engineer Battalion (In Lieu of [ILO] Utilities Detachment), Kingston, New York.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Noel Miliam, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Sturgis Medal: Staff Sergeant Ryan Patton, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Van Autreve Award: Specialist Jeremy Baum, Charlie Company, 458th Engineer Battalion (Corps) (Wheeled), New Kensington, Pennsylvania.

Army National Guard

Itschner Award: Headquarters Support Company, 203d Engineer Battalion (Combat) (Heavy), Webb City, Missouri.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant John R. Vagnier, Bravo Company, 216th Engineer Battalion, Portsmouth, Ohio.

Sturgis Medal: Sergeant Raymond A. Boso, Charlie Company, 216th Engineer Battalion (Combat), Youngstown, Ohio.

Van Autreve Award: Specialist Cory L. Cummings, Detachment 1, Alpha Company, 203d Engineer Battalion (Combat) (Heavy), Joplin, Missouri.

All of the nominees represented their major commands with the highest professionalism and dedication to the Engineer Corps's vision and deserve our highest praise. The award recipients were recognized at the Army Engineer Association Engineer Regimental Conference, 24-27 October 2005, in Orlando, Florida.

COMPOSTING SOLID WASTE IN MILITARY CONTINGENCY OPERATIONS

By Mr. Joseph Bost, Mr. Stephen Stouter, and Mr. James F. Lee

Armies around the globe have always had to deal with the problem of solid waste. Today, a large percentage of solid waste is packaging materials (cardboard, paper, and plastic), in addition to waste food and sewage sludge. While much of the solid waste generated at base camps is biologically degradable, the solid waste problem presents significant waste management challenges for the U.S. Army. This is a particular concern when we operate in countries where there are few—if any—modern waste disposal facilities.

During the past 2 years, the United States Army Europe (USAREUR) Engineer Support Operations (ESO) has tested a composting system that converts up to 85 percent of the putrescible waste (waste that decomposes) generated at base camps into a usable product. Additionally, this composting system greatly reduces pathogens, as well as minimizes odor and bioaerosol emissions. The compost produced by the system can be used in a variety of ways, including erosion control, soil amendment, or land application in agricultural, forestry, or mine reclamation use.

When contingency operations (CONOPS) base camps are initially established, solid waste landfills are normally not available. Solid waste is usually taken to a burn box to be incinerated. This process requires approximately 1 gallon of fuel per cubic meter of waste and reduces the volume of waste by approximately 80 to 90 percent. The residuals (for example, ash and incompletely burned solid waste) must then be transported for disposal. However, many local waste disposal sites are burial pits or excavation sites, and most of them lack liners, daily covers, run-off controls, or other modern techniques used for managing sanitary landfills. These disposal site conditions present another set of significant environmental problems, such as toxic leachate, vector attraction, and even greenhouse gas creation. The process of burning solid waste, including low British thermal unit (BTU) value wastes (for example, dining facility [DFAC] and other organic or wet waste), is to soak it with diesel fuel and incinerate it in a burn box. The burning waste emits toxic, acrid smoke that has led to health complaints from military personnel due to eye and lung

irritation. At a base camp in Kosovo, there have been numerous Soldier and chain-of-command complaints regarding smoke from incinerator use.

With troop safety a vital concern, it is critical to effectively treat solid waste and sewage sludge. Soldiers' safety and quality of life are enhanced by reducing pathogens associated with sewage sludge and reducing the amount of solid waste burned. It is also essential to minimize the volume and toxicity of solid waste disposed at disposal sites that lack modern environmental controls. USAREUR ESO has tested various methods to improve CONOPS solid waste management and reduce long-term environmental liabilities and risks.

At a base camp in Kosovo, the practice of burning solid waste ended in October 2005. USAREUR ESO—along with COMP-ANY GmbH and Kellogg, Brown, and Root (KBR)—will use composting combined with recycling and landfill disposal. After successful pilot testing during 2004 and 2005, a full-production mobile aerated static heap composting system was deployed to the base camp in September 2005. The new AGILE™ flex system incorporates semipermeable membrane technology that—



More than 1,000 boxes of sewage sludge are stockpiled at this base camp. It was composted during the beginning of a pilot study in 2004.

- Mitigates the effects of extreme weather on composting.
- Accelerates the natural composting process.
- Minimizes manpower costs.
- Allows composting to occur within the confines of a small base camp due to the more than 90 percent reduction in odor and vector attraction.

The odor is reduced due to the scrubbing effect of the semipermeable GORE-TEX® membrane cover that also blocks vectors. The AGILE flex system has shown excellent results by minimizing pathogens and other problems created by solid waste in CONOPS. The AGILE flex system increases composting efficiency by using cardboard and paper waste generated by the base population to balance the carbon-to-nitrogen ratio. This is critical to the successful composting of high nitrogen content waste, such as sewage sludge and food or catering waste.

Currently, the Directorate of Public Works at the base camp in Kosovo and KBR manage and compost solid waste consisting of sewage sludge, DFAC waste, wood chips, shredded cardboard, paper, and hay. These ingredients are mixed and placed in a heap over air feeder aeration tubes that extend from a standard International Standards Organization (ISO) shipping container. A GORE-TEX fabric cover is placed over the heap and held to the ground with a water-filled fire hose. Temperature- and oxygen-monitoring probes are inserted through the cover into the heap to record heap temperature and oxygen data. Blower fans, controlled by a computer located in the ISO container, force air into the heap based on real-time feedback from the probes. During the initial 3-week processing period, bacterial activity is controlled as the computer automatically adjusts the air flow to maintain optimum temperature and oxygen levels. Internal compost

temperatures easily achieve 150 to 165 degrees Fahrenheit. After the initial 3-week period, the compost heap is uncovered and moved to the opposite side of the ISO container. The compost heap is treated with the same procedure for an additional 3 weeks. After the total 6-week period, the compost is ready to be tested and used for soil amendment.

Composting will reduce fuel costs associated with burning solid waste. In the past, the U.S. Army paid \$65,000 for a year's worth of JP-8 (jet propulsion fuel, type 8) used as an accelerant to burn waste. That expense will no longer be necessary. Additionally, USAREUR ESO estimates that composting will require fewer man-hours. After successfully treating 100 percent of the sewage sludge and DFAC waste generated by two base camps in Kosovo during 2004 and 2005, the USAREUR ESO firmly believes this composting process will lead the Army into the next generation of solid waste management systems for contingency operations.

The AGILE flex system has proved to be a powerful solid waste management tool through its simplicity, reduced operating costs, reliability in all weather conditions, and the short processing time for the treatment protocol. Also, this system enhances force protection by reducing Soldier transport or escort to off-site waste disposal areas. Because of its compact (ISO container), mobile, and self-contained characteristics, this innovative system is especially beneficial in CONOPS. The ability of this system to successfully treat large amounts of solid waste on-site within a short time period increases its value to the U.S. Army mission.



Mr. Joseph Bost is the chief of Engineer Support Operations, Office of the Deputy Chief of Staff, Engineer (ODCSENG), and is responsible for the military and civil construction, engineer operations, and environmental programs occurring in the Balkan area of operations. He holds a master's from the University of Southern California.

Mr. Stouter is the program manager for the Corps of Engineers, Afghan Engineer District, Kabul, Afghanistan, and worked with the ODCSENG staff on critical environmental and facilities functions in Kosovo and Bosnia. He holds a degree in biology from Middle Tennessee State University in Murfreesboro.

Mr. Lee is an environmental management officer for ODCSENG, USAREUR, and is responsible for environmental policy and problem solving associated with contingency operations. He holds a degree in energy and environmental management from City University in Bellevue, Washington.



The waste heap is placed on top of the aeration tubes, and the cover is placed over the heap. The temperature and oxygen-monitoring probes are placed through the cover into the heap.



ENGINEER UPDATE

Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Urban Mobility Breaching Course (UMBC). The UMBC is a 3-week course conducted at Camp Lejeune, North Carolina, by the United States Marine Corps, with assistance from three United States Army engineers. Two weeks of the course are consolidated training, and the remaining week is Army-unique. The maximum Army course load for the UMBC is 15 students. Slots for the course can be reserved through the Army Training Requirements and Resources System (ATRRS).

The UMBC provides advanced information on urban breaching operations. The course consists of in-depth explosive theory; detailed planning that combines operational and training safety issues; urban reconnaissance; and employment of urban breaching assets, including explosive, manual, and ballistic breaching techniques for urban operations. The UMBC teaches the use of Current Force equipment that supports mobility operations in support of the maneuver force.

Students must meet requirements listed in Department of the Army Pamphlet 611-21, *Military Occupational Classification and Structure*, and Army Regulation 600-9, *The Army Weight Control Program*; be a combat engineer noncommissioned officer in the grade of E-5 (P) through E-7 and a graduate of the combat engineer Basic Noncommissioned Officer Course (BNCOC); have no

pending Uniform Code of Military Justice (UCMJ) actions; and have no limiting profiles.

Fiscal Year 2006 Class Schedule		
Class Number	Report Date	Graduation Date
01-05	16 Oct 05	4 Nov 05
02-05	27 Nov 05	16 Dec 05
03-05	22 Jan 06	10 Feb 06
04-05	26 Feb 06	17 Mar 06
05-05	4 Jun 06	23 Jun 06
06-05	13 Aug 06	1 Sep 06
07-05	10 Sep 06	29 Sep 06

The point of contact for this course is the Directorate of Training and Leader Development (DOTLD) Sergeant Major at (573) 563-4094 or e-mail <atsedot@wood.army.mil>. The DOTLD Web site is at <<http://www.wood.army.mil/dotld/>>.

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Center for Engineer Lessons Learned (CELL). The United States Army Engineer School CELL needs your help. To keep training, doctrine, and combat developments current and to prepare for the future, it is critical that the school continuously receive relevant engineer observations, insights, and lessons (OIL). The CELL can derive information from a variety of sources: unit after-action reports (AARs); tactics, techniques, and procedures (TTP) used by units in and returning from theater; Soldier observations/submissions to the Engineer School; and requests-for-information (RFIs).

This information is used to conduct doctrine, organization, training, material, leadership and education, personnel, and facilities (DOTMLPF) gap analyses and

to determine solutions. These solutions are distributed to the Engineer Regiment via new doctrine and training products, *Engineer* (The Professional Bulletin of Army Engineers), and other publications, Web sites, and by answering RFIs. (The Engineer School RFI Web site provides the Engineer Regiment a reach-back capability.)

You can help by forwarding any of these materials from your unit's deployment to the CELL point of contact. Unclassified information can be sent by e-mail to <Doctrine.Engineer@wood.army.mil> or <reggie.snodgrass@us.army.mil>. Classified information can be sent by secret Internet protocol, routed (SIPR) e-mail to <snodgrassrg@monroe.army.smil.mil>. For more information, call (573) 563-4117.

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Visual Archive. The History Office at the Engineer School is developing a visual archive. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry

Roberts, Historian, United States Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, call Dr. Roberts at (573) 563-6109.

Reserve/National Guard Instructor/Writers Needed. The Reserve Component Captain's Career Course at the United States Army Engineer School, Fort Leonard Wood, Missouri, currently has instructor/writer positions open for Reserve/National Guard members.

These are Individual Mobilization Augmentee (IMA) positions and allow for annual training as well as drill time. The positions open are for engineers in the rank of O-3 and O-4. For more information, e-mail <tim.obrien1@us.army.mil>.

Personal Role Radio (PRR). Situations occasionally dictate the need for construction equipment operators to have communication capability with a Soldier on the ground. This is especially true when operating a system that is equipped with add-on armor. One solution is the

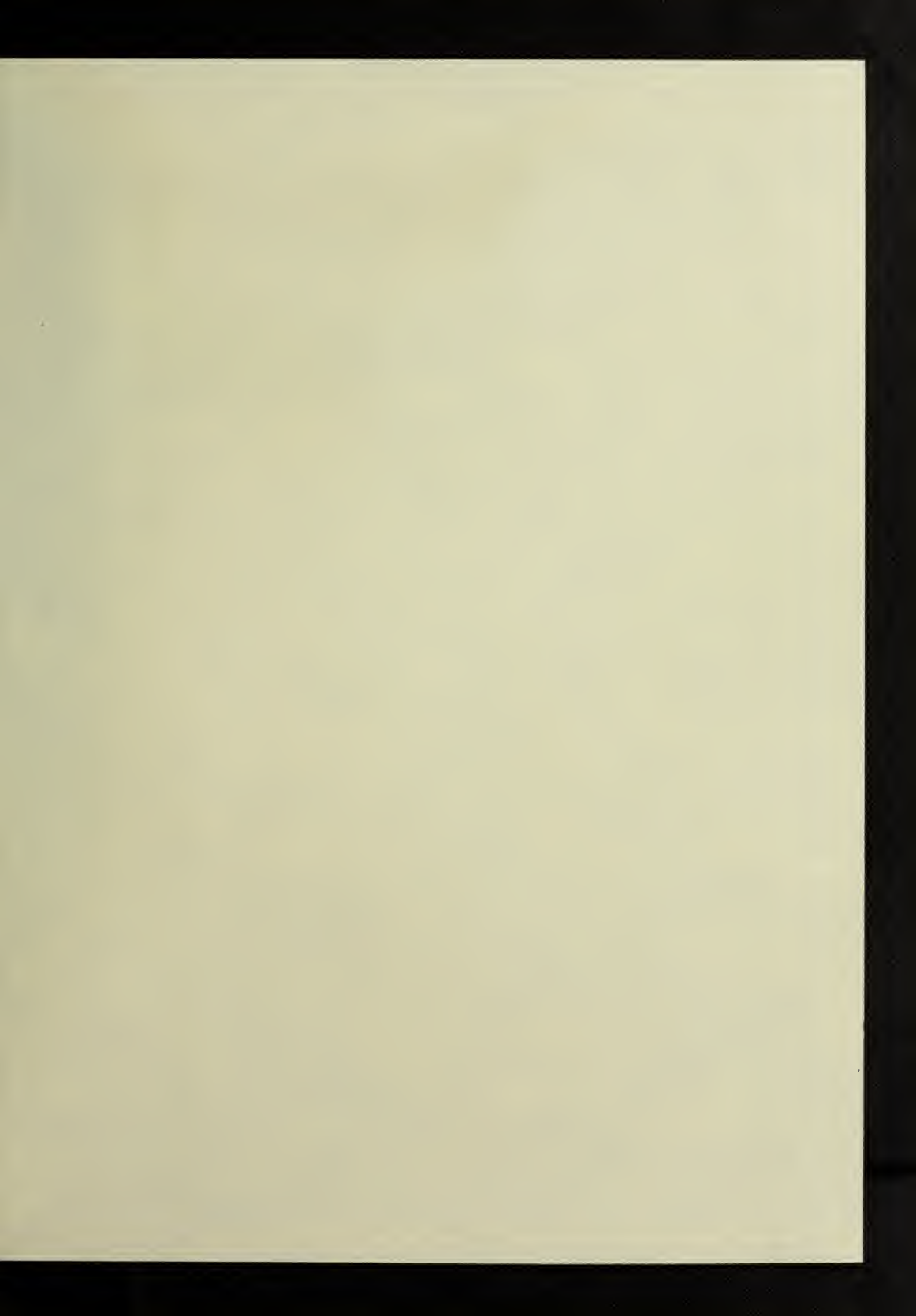
PRR, which is already being used by multirole bridge companies when employing dry support bridges. The PRR is available for units to order through the General Services Administration (GSA) (refer to the table below).

Personal Role Radio Capabilities		
North Atlantic Treaty Organization (NATO) Stock Number	Product Code	Description
5820-99-721-8335	P21050000	<i>PRR Body (Green) Complete – English</i> The PRR body is complete with an antenna and an English user card. Must be used with single or dual push-to-talk (PTT) switch assembly. Requires two AA batteries (included).
5820-99-739-4033	P08130000	<i>Single PTT Switch Assembly (Green)</i> The single PTT switch assembly is for use with the PRR body.
5820-99-342-4097	P08120000	<i>Remote Wireless PTT (Green)</i> The wireless PTT remotely operates the PRR. Supplied with a black adjustable strap and buckle.
5820-99-280-7276	P14360408	<i>CT/Light Patrol Headset (Green) – Noise-Canceling (NC) Electret Microphone</i> The vented, single-sided headset has an NC Electret microphone fitted to a flexible boom arm. Fitted with an adjustable headband, the headset can be worn underneath most passive ear defenders.
5965-99-664-9722	P07100000	<i>Nuclear, Biological, or Chemical (NBC) Boom Microphone Adapter</i> The adapter is for use with most Davies headset models. One end fits over the headset's boom microphone and the other end plugs into the respirator's speech module.
5820-99-425-3999	C410114	<i>Carry Pouch (Green) – United Kingdom (UK) Pattern Disruptive Pattern Material (DPM)</i> The PRR fits inside a heavy-duty polyurethane, textured nylon pouch that attaches to webbing and helps protect the PRR from harsh conditions/impact.

For more information, contact the MANSCEN Futures Center, Engineer Division, at <bryan.k.barwick@us.army.mil> or call (573) 563-7992.









The HF Group

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